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AMERICAN INDUSTRIES.—No. 66.

BARREL MACHINERY.

Our commodities are handled and stored to a great extent in packages which may be classed under the general head of barrels; these packages are cheaper, stronger, and easier handled than other forms, and in many instances they are the only practicable package. Oil, liquor, pork, flour, sirup, sugar, and many other articles that could be named are almost without exception packed in barrels. The enormous demand for packages of this class have rendered their manufacture one of the leading industries of the day.

Not many years ago barrels were made almost exclusively by hand, but in this, as in all other manufactures of any magnitude, machinery has been demanded and is now furnished for the majority of operations in barrel making, and as a consequence the article has been both improved and cheapened.

In the manufacture of machinery for making staves, heading, hogsheads, barrels, and kegs, Messrs. E. & B. Holmes, of Buffalo, N. Y., undoubtedly take the lead, their machines being in use the world over.

Our engravings represent several of these machines of the most recent and approved styles. We understand that this firm make some forty different machines for the manufacture of barrels.

Fig. 1 shows a machine for dressing staves on both sides for beer kegs, barrels, and heavy casks. It takes the stave out of wind, and does heavy work that has heretofore been done by hand. This has been greatly needed, and is of great value to makers of casks. It receives the stave in the rough rived state, and while dressing both sides of the stave simultaneously, brings it to an even thickness, and takes all of the wind and crook out of it. It is contrived so as to save all of the timber that can possibly be saved, and will dress the staves as rapidly as the attendant can put them into the machine. After being dressed in this machine the staves are passed through the inside stave dresser, shown in Fig. 2, which hollows out or thins from the inner side of the central part of the stave, leaving it of the original thickness at the ends. This machine is more especially designed for preparing staves for beer kegs, barrels, and other large and heavy casks, the idea being to leave the ends of the cask full thickness to receive the heads, while the central portion of the cask is made thinner to increase the capacity of the cask and to allow the staves to be drawn into the barrel form with the application of less power and with less breakage than with staves of the usual form. This machine is very rapid in its operation, finishing with ease 6,000 staves a day.

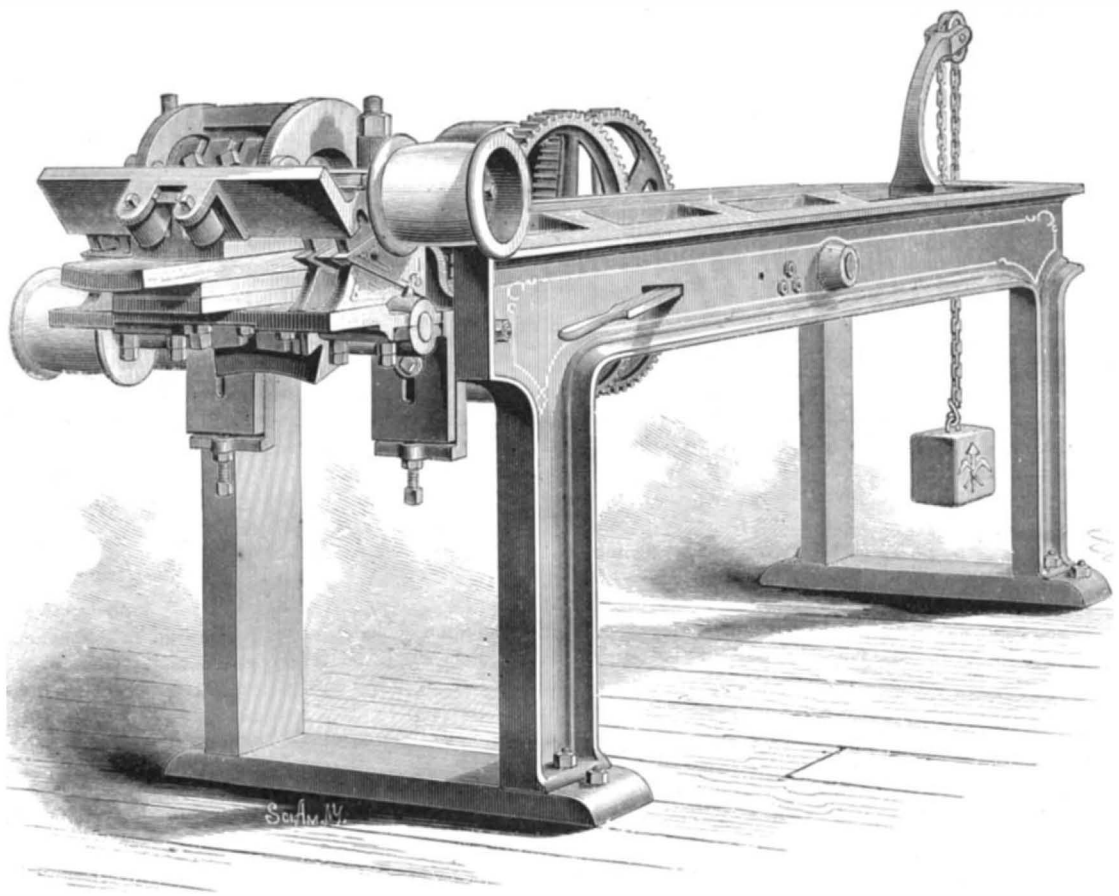

Fig. 1.—MACHINE FOR DRESSING STAVES FOR BEER KEGS BARRELS AND CASKS.

The next machine in the order of sequence is the combined fan and stave jointer, shown in Fig. 3. It is capable of jointing staves of different lengths and thicknesses, and will work equally well on rived and sawed staves, taking out all winds and crooks by means of the powerful clamps attached. The capacity of this machine is 8,000 staves per diem.

The casing inclosing the jointer wheels is constructed so that it makes an exhaust fan of the machine, which carries the savings through suitable conductors to any desired distance. This machine joints staves for all kinds of casks for oil, spirits, sirups, etc., also for beer kegs and barrels, and finishes the stave ready to set up.

The machine shown in Fig. 4 is for drawing the staves together at one end of the cask after the other ends of the staves have been set up in the head truss hoop. This machine is operated by screw power, and will draw together the most stubborn casks, and is adapted to various sizes. An expert operator can windlass from 1,200 to 1,500 barrels per day on this machine. The wire rope being placed around the cask and the power applied, the staves are very quickly brought together, when the remaining truss hoop may be put on, when, by depressing a foot lever, the cask is instantly relieved, and the machine is ready for another.

Messrs. E. & B. Holmes make a truss hoop driving machine (not shown) which drives the truss hoops with such power as to compress the wood of the staves and make perfectly tight joints.

[*Continued on page* 114.]

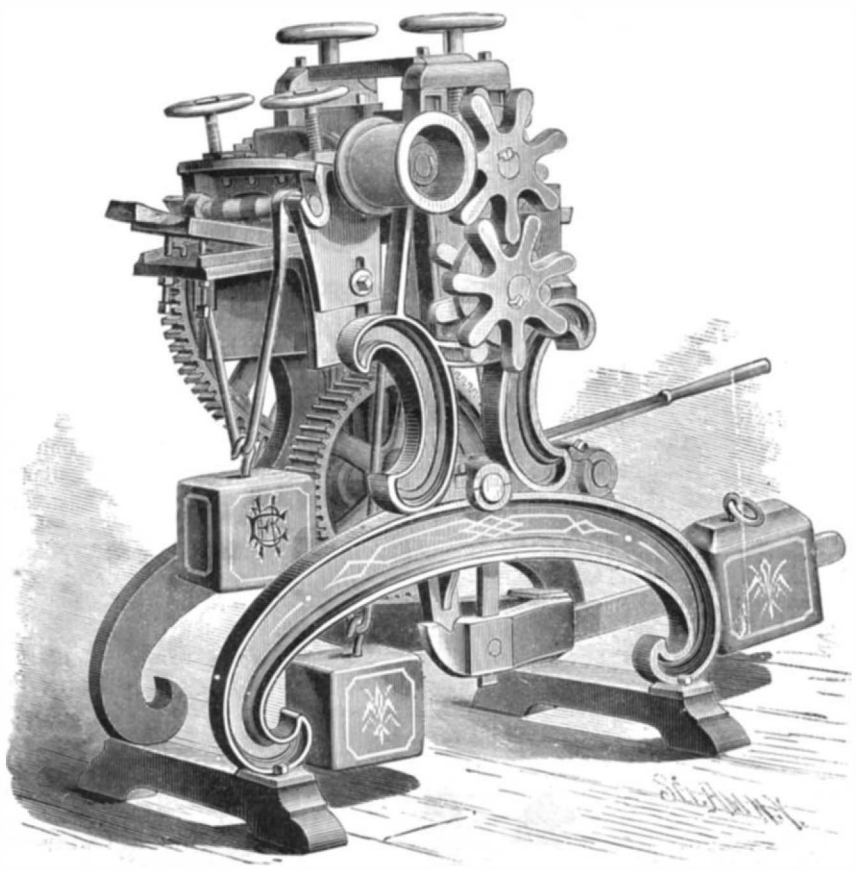

Fig. 2.—MACHINE FOR HOLLOWING STAVES FOR BEER KEGS, BARRELS, AND CASKS.

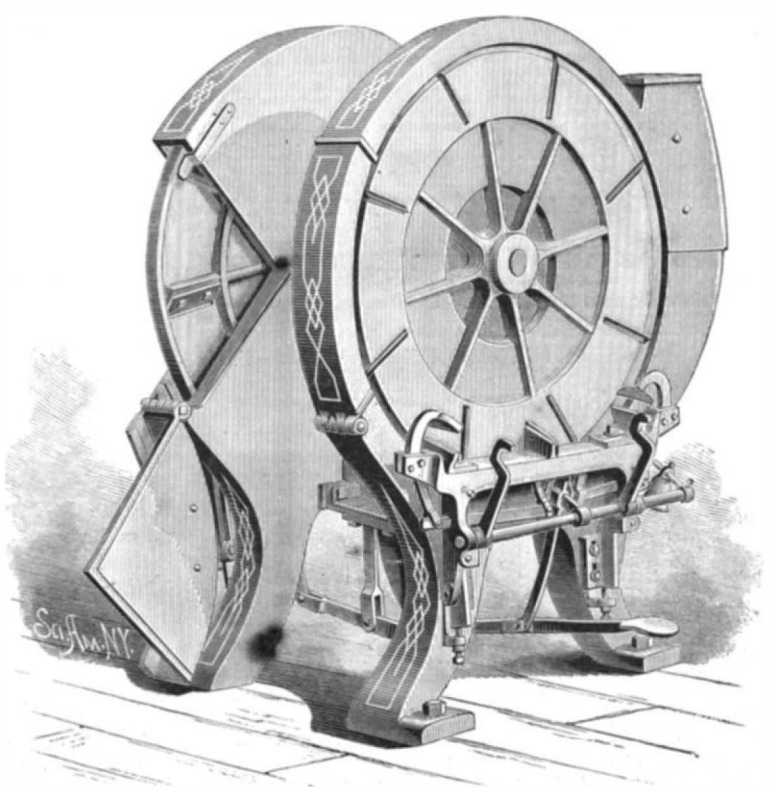

Fig. 3.—COMBINED FAN AND STAVE JOINTER.

BARREL MACHINERY MADE BY E. & B. HOLMES, BUFFALO, N. Y.

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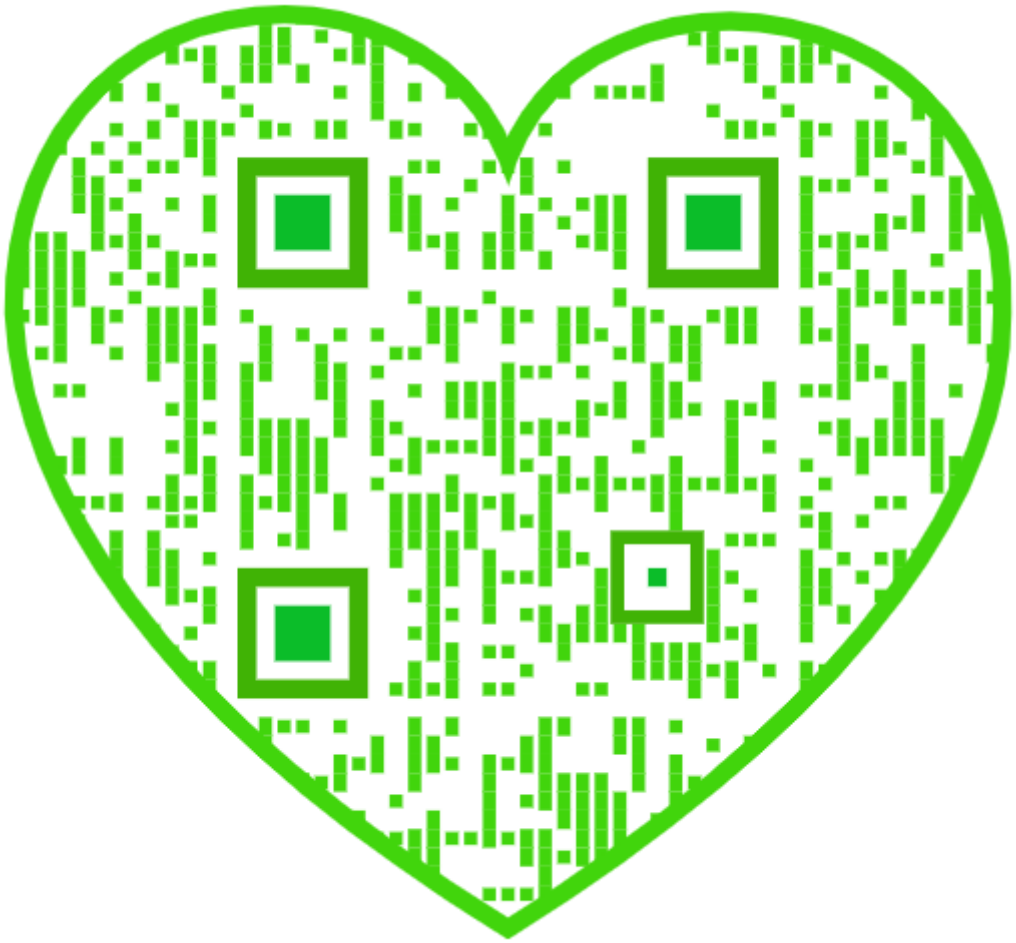

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NEW YORK, SATURDAY, FEBRUARY 19, 1881.

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RIGHTS OF PATENTEES WHILE IN THE EMPLOY OF THE GOVERNMENT.

This subject has been brought before Congress, through the introduction of a bill (S. No. 730) for the relief of Mrs. S. A. Wright, widow of the late George Wright, who (as it appears from the report of the Committee on Patents), while he was employed as master machinist in one of the government shops, invented and patented an improved linch-pin for field artillery carriages. The invention was adopted by the Ordnance Department, in September, 1863, and has since been used by that department.

The invention consists in forming the top of the linch-pin with a hook which turns down over the end of the axletree and prevents the linch-pin from coming out, affording security against the accident of wheels coming off from field artillery in traveling rapidly or over rough ground. As no compensation was ever received by Mr. Wright or his heirs from the government for the use of this invention, the committee recommended the passage of the bill. A lively and somewhat protracted debate ensued, in which many senators took part.

Senator Logan stated that, in cases of this kind, it had formerly been unanimously considered by the Senate "that a person in the army or in the employ of the government, receiving his pay, using the machinery of the government for the purpose of experimenting, had no right to compensation from the government for any invention made during that time. That has been the rule for years in the Senate and in Congress."

Senator Platt considered the rule well established "that where an employe of a private individual, using the time and the tools of that individual, a manufacturer for instance, has made a valuable invention, while the patentee owns his invention, the manufacturer has a kind of equitable license to use it."

Senator Hoar assumed that Wright "was under no obligation to improve the government's wagons or the government mechanism of any kind any more than any other citizen of this country; so that he did not invent this while in the employ of the government in any correct legal sense of that term. He invented it in his own right and in his own time, and the invention was his own property, and is just as foreign, as alien to that employment as if the Senator from Illinois, twenty years ago, when in a private capacity, had made the same invention."

Mr. Hoar, in further discussing this question, deemed it a very important matter that the principle upon which the report of the Committee on Patents was made should be established as the rule of action for the government in the future. "If this government is to excel other nations in war as it has in peace, it cannot afford to do without the resource of the inventive faculty of its people."

The case would, in his opinion, have been different if the Chief of the Ordnance Department, whose duty it is "to recommend, to direct, to improve the construction of ordnance for the use of the government, had made the invention patented by Wright. In the exercise of his mind upon a question like that, that officer would be in the employ of the government, because it would be exactly in the line of duty which he is paid by the government to perform.

Senator Conkling's opinion was, that if any person in government employ made an invention not within the hours of his employment—*i. e.*, out of hours—in that case he ought to have the benefit of his invention.

Mr. Conkling opposed the bill, chiefly because he thought it questionable whether Wright was the original inventor of the linch-pin in question.

This discussion betrays, on the part of the senators named, with the exception of Mr. Hoar, a curious misapprehension of the spirit of our patent system and the ruling of the courts with regard to the rights of patentees; and even Mr. Hoar might properly have taken higher ground with respect to the duty of inventors. While it is true that an employe of the government is under no legal obligation to improve the means and materials of the service, he is still, like every other good citizen, morally bound to make any invention he can for the public good. The fact that he is in government employ, however, or is employed by an individual or a corporation, is no bar to his right to control his invention if he chooses to take out a patent for it.

Mr. Conkling errs in assuming or implying that an inventor's right to take out a patent and control it is limited to inventions made "by the application of time not within the hours of his employment" by another. The patent law prescribes no such limit. It asks no question beyond the fact of invention. How the inventor was otherwise employed, or by whom, or for what purpose, has nothing to do with the case. The patent is issued to the inventor on his complying with certain conditions which make no reference to his employment by the government or anybody else. The position taken by Mr. Platt is, therefore, widely and mischievously incorrect. Unless the inventor has agreed to assign the patent of any invention he may make to his employer, the latter has no legal claim upon it, no matter what were the circumstances under which the invention was made.

If, as Mr. Logan states, it is a rule in Congress to deny to inventors in the employ of the government any compensation for patented inventions it may choose to make use of, the rule is a bad one and should be speedily amended. It is absurd as well as unjust for the government thus to violate contracts entered into with it in good faith by its citizens. We are of the opinion that the Senator must be entirely wrong in the assertion he makes; for how could one branch of a legislative body pursue the policy of overriding laws made by both houses and sustained by the highest judiciary of the land? That Congress as a whole would have as little right to infringe the property rights of an inventor, whether in government service or not, or to authorize an officer of the government to use without compensation a patented invention, is equally clear.

The clause of the Constitution (section 8), which provides for the issuance of letters patent for new and useful inventions, expressly provides that the inventor shall have the exclusive control of his invention. The letters patent, bearing the seal of the United States, explicitly describe the exclusive ownership of the patentee. The grant reserves nothing for the government. The property right covered by the patent is exclusive and absolute throughout the United States, and can no more be invaded without compensation by the government than any other property. This has been the ruling of the courts, and the rule was recently reaffirmed by the U. S. Circuit Court, Southern District of New York, in the case of Campbell *vs.* James *et al.*

In this case a patent had been infringed by an officer of the government. The defendant claimed that there was no infringement; that he had acted as an officer of the government in the performance of his duties for the benefit of the government, and that the monopoly granted in the patent did not extend to or cover any use by the government. The court ruled otherwise, and held that a patented invention, like all other private property recognized by law, is exempt from being taken for public use without just compensation by the supreme law of the land, and that such property cannot be taken by any officer in time of peace, leaving the owner to seek compensation. Accordingly the defendant was declared an infringer and ordered to pay damages and costs to the amount of $63,000.

It is obvious that any policy like that said to be pursued by the Senate would simply encourage the officers of the government in the performance of unlawful acts; and (except in cases of military urgency) any arbitrary seizure or use of patented inventions, whether owned by a government employe or not, lays the infringing officer liable to prosecution and punishment—the exception made in cases of military necessity raising no bar, any more than with other species of property, to a lawful claim for compensation.

VACCINATION AND REVACCINATION.

The immunity from epidemic small-pox enjoyed by civilized communities, thanks to general vaccination, is to be preserved only by constant vigilance. With the flood of immigration pouring in upon us, largely from countries in which vaccination is not general among the poorer classes, our American towns and cities need to be particularly vigilant.

It is but a little while since an attempt was made to conceal the prevalence of small-pox among a ship load of Italian emigrants on their arrival at this port; and our city barely escaped having the contagion thus dispersed in many quarters, and among a class indifferent to sanitary precautions. The frequent occurrence of the disease among the same people and others of a like social grade, at this season, is proof enough that the efforts of the sanitary police to quarantine infected incomers are not always so successful.

With our rapid railway communication it is easily possible for infected parties to travel long distances between the time of their exposure and the breaking out of the malady enough to betray its presence. In this way a neighboring city was lately infected by a party of Canadian operatives, who brought the seeds of the disease with them. In like manner the epidemic now raging in Southern Dakota appears to have been imported by newly arrived emigrants, and widely distributed among the French Canadian settlements by public funerals and other practices common to people ignorant of or indifferent to the proper treatment of contagious diseases.

A striking illustration of this wanton disregard of personal and public safety among people of this sort is given in the recent report of the New York State Board of Health. For some months small-pox has been very prevalent in and about Troy, particularly among the factory people of the adjacent towns. Eighty persons of this class attended an evening party masked. On unmasking for supper it was discovered that one of the dancers had varioloid eruption upon her face. The party was not to be broken up by any little thing like that, however, and the dancing continued until morning. Within a fortnight twenty-two of the eighty were down with the disease, and eleven others had contracted small-pox from them, only one case occurring outside the twenty-two families first exposed. Compulsory vaccination and other sanitary precautions were promptly enforced, and the epidemic was stamped out.

Similar cases of criminal indifference to the spread of contagion, though involving perhaps a smaller number at a time, have come to the knowledge of our City Board of Health, and the result is, as many as sixty cases of small-pox are now under treatment at Riverside Hospital. Sixty out of twelve hundred thousand is by no means an alarming number; still it is large enough to warrant especial care on the part of the community to guard against contagion.

Small-pox is relatively so rare among native born Americans, and anything like epidemic small-pox is so infrequent, that people not only neglect to have their children vaccinated early, but still more to have vaccination repeated when it has once been apparently well done. Not a few people have also been kept from having their children vaccinated by the absurd and often untruthful reports of anti-vaccinationists.

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A vast amount of mischief has been done in this way by people who think they have the good of the community at heart. Against their extravagant and often baseless assertions our Boards of Health set overwhelming evidence that the frequency and virulence of small-pox have been greatly mitigated by vaccination wherever it has been systematically practiced. The records of Riverside Hospital, where the small-pox patients of this city are sent, show that the mortality among the unvaccinated is from two to three times as great as among those who claim to have been vaccinated; and it is well known that with a considerable portion of those who have been vaccinated the work has not been well done, or the protection has become diminished by time.

During the epidemic in Philadelphia ten years ago less than a quarter of the deaths among those who had been vaccinated were of those who showed a good typical scar.

Where re-vaccination had been carefully practiced the immunity from the disease seemed almost perfect, and in the few cases in which small-pox was taken by such persons none died. The statistics on this head are instructive. The report of the physician in charge of the hospital for small-pox patients (Dr. Gunn) says:

"Among 2,377 cases of small-pox admitted during the epidemic, only 36 are said to have been re-vaccinated, of which four died. But by subjecting these cases to a careful analysis, we find as follows: Seventeen were re-vaccinated at a distant period, some as far back as thirty-one years; five had not been re-vaccinated until after exposure; seven were said to have been successfully re-vaccinated, but were unable to exhibit any cicatrices as the result; sixteen bore upon their arms very poor and uncharacteristic scars, some of which, indeed, were scarcely visible; five presented fair cicatrices; and only three cases were able to show good cicatrices. Of the four cases which died, two occurred among those without cicatrices, one among those re-vaccinated after exposure, and one among those showing poor and uncharacteristic scars. All the cases which bore upon their arms unmistakable evidence of successful re-vaccination suffered from the mildest form possible of the disease. Indeed, three of these cases exhibited an eruption of doubtful character, and have therefore been recorded as cases of varioloid (?). The eruption on three others did not advance beyond the papular stage; and on seven it was barely vesicular. From the foregoing facts, we are fully prepared to earnestly and cordially recommend re-vaccination as a most necessary supplemental measure to the primary vaccination."

Evidence of this nature is abundant. And the surest way to prevent small-pox epidemics, or the popular alarm which attends threatened epidemics, is to vaccinate and re-vaccinate from time to time until no further "taking" is possible.

THE PETROLEUM BASINS OF WYOMING.

Prof. Samuel Aughey, who has recently examined the Shoshone and Beaver oil basins in the Territory of Wyoming, has just made a report to the owners, and from this we glean the following particulars in regard to these important deposits of petroleum. The Shoshone springs are 78 miles from the Union Pacific Railroad, and immediately north of Point of Rocks station. The extent of the basin is about forty acres. In past ages a lake of petroleum covered the entire basin, a fact which is now evidenced by a remaining covering of hardened oil. Within the basin there are now hundreds of points from which gas and oil are continually issuing. The land, claimed and held by a stock company, aggregates 400 acres, embracing all the old oil basin, and title has been secured under the United States mining laws. This company has sunk a number of shafts, which are now used only for the storing of oil. Prof. Aughey computes the amount at present collected and held ready for shipment to be about 1,500 barrels, but there are as yet no facilities for transportation to the railroad. He believes that the ultimate capacity and extension for production of this oil basin is very great, and that the quantity of oil stored away in these Wyoming reservoirs is greater than in more eastern localities. The oil is intensely black, the coloring matter being inseparable by any method or process as yet tried. Distillation of a small quantity gave 0.63 naphtha. There was 47 per cent of a kerosene, having 150° flash test. It then produced 32 per cent of a neutral and lighter colored lubricating oil, with 12 per cent of dry coke. The oil as it flows has a gravity of 20°. Its flash test is 294° and fire test 322°. Cold test 16° below zero. The Beaver oil basin is situated 25 miles directly east from the Shoshone, and in every respect seems separate and distinct from the latter. The oil which issues here is of a much lighter color than at the Shoshone deposits, varying from a pale yellow to a light mahogany. It has a gravity of less than 20°, and, as far as tried, has proved an extraordinary lubricant, with an excellent cold and fire test. Its odor is no more unpleasant than that of lard oil. Included and connected with these oil basins there exists a magazine of fuel, which for extent and value is extremely important. A very slight alteration in furnaces will admit of this hardened hydrocarbon as a fuel for general use. Even now, and surrounded by such vast deposits of lignites, it does not seem to be any too soon to call attention to a combustible of ten times the potency of coal for generating steam. It has, moreover, in its favor a saving of labor and expense in mining, and an advantage of 90 per cent of weight. There are millions of tons of this hardened oil near the surface in these two basins. Russia is already utilizing *her* hardened oils of the Caspian Sea in operating her railroads, and it is safe to say that the railway which crosses Wyoming Territory will not remain long unmindful of the rich and cheap deposit of fuel which lies so close at hand.

EXPERIMENTS WITH UNDERGROUND WIRES.

After a three months' test of their system of insulating telegraph and telephone wires underground, the national Subterranean Electric Company have applied for permission to introduce their system in Philadelphia. The company claim that when once introduced on their plan, telegraph, telephone, or other wires can be used in separate chambers, and that no disturbance of the pavement will be required for repairs or for additional wires. In the experiment referred to, in Camden, the telephone wires were, after three months' use apparently in as perfect condition as when first laid down. The plan embraces a system of terra-cotta cylindrical blocks, perforated lengthwise with several small holes, vitrified and lined with rubber. These blocks are laid end to end, cemented together, and form groups of pipes through which wires or cables are run. These pipes are laid in sections, at the end of each a sunken chamber affording workmen access to the pipes and wires for purposes of repairs or laying additional wires, which can be strung through the sections from chamber to chamber. The chambers are covered when not in use, and afford no obstruction to travel. The cost of the system is not given.

What is claimed as a cheap and durable system is under trial in Prospect Park, Brooklyn. The wires are strung in a trough of pine wood, into which is poured a mixture of pulverized glass, resin, and other ingredients made semi fluid by heat. In this compound, which becomes hard on cooling, the wires are hermetically sealed. It is claimed that the mixture has a very high insulating power, is durable, and sufficiently elastic to maintain its integrity under varying pressure. A bundle of wires of any length can thus be laid in sections without a break, and operated with a relatively small battery power, owing to the perfection of the insulation. The cost of the system is given at $1,500 a mile. The number of wires and the space between them are not given.

A more expensive and not altogether satisfactory system is used in London, where something like a hundred miles of underground lines have been laid. In this system the iron or earthen piping is in sections of 200 yards, separated by test and joint boxes. The cables are composed of 60 No. 18 copper wires insulated with gutta percha. The cost is given at about $7,000 a mile. The maintenance of perfect insulation is difficult, and when a fault occurs the whole cable has to be withdrawn and repaired.

A TELEPHONIC CONTROVERSY SETTLED.

An interesting controversy as to priority of invention has been going on before the Patent Office for the past two years between Alexander Graham Bell, the telephone inventor, and David Brooks, of Philadelphia, the well-known electrician. The invention in dispute was the use of a return wire on a telephone circuit, to prevent the noises of induction. On some of the city telephone lines the noise produced by induction from electrical currents is so great as to form a serious obstacle to the use of telephone instruments. If one attempts to listen there is such a loud bubbling noise heard, and such a mixture of clicks and other voices, which come in from the neighboring wires, that the principal satisfaction of conversing with one's correspondent is taken away. If the telephone wire passes in the vicinity of Western Union wires, on which Gray's harmonic telegraph instruments happen to be at work, then there is added to the general confusion of tongues a series of tootings or cat calls that are quite distressing to the ears of sensitive telephoners. Professor Bell and Professor Brooks discovered the remedy; it consists in using two wires on the telephone circuit instead of a single wire. If an extra wire, insulated, is stretched close alongside of the usual single wire, the extra being employed as a return circuit wire, instead of the earth, then all noise from induction disappears, and telephoning becomes a pleasure.

The Commissioner of Patents decides that the priority of invention belongs to Prof. Brooks, he having made the invention in July, 1877, whereas Bell did not make it until the end of August, 1877. But, more than this, Bell's date of invention must, by law, be carried forward to the date of the final enrollment of his English patent, May 18, 1878; as it is not allowable, in this country, so far as proofs of invention are concerned, for any applicant, if he takes a foreign patent before he applies for an American patent, to go back of the date of his foreign patent. Bell did not apply for his American patent until December 20, 1878. The Commissioner of Patents, therefore, reversed the decision of the Board of Examiners in Chief, and awards the discovery to Professor Brooks, to whom it clearly belongs.

Gilding Steel.

Polished steel may be beautifully gilded by means of the ethereal solution of gold. Dissolve pure gold in aqua regi , evaporate gently to dryness, so as to drive off the superfluous acid, re-dissolve in water, and add three times its bulk of sulphuric ether. Allow to stand for twenty-four hours in a stoppered bottle, and the ethereal solution of gold will float at top. Polished steel dipped in this is at once beautifully gilded, and by tracing patterns on the surface of the metal with any kind of varnish, beautiful devices in plain metal and gilt will be produced. For other metals the electro process is best.

Effect of a Galvanic Current upon the Absolute Strength of Iron Wire.

Some experiments made by G. Hoffmann to determine this point have recently been made public, and will perhaps surprise many of our readers, some of whom will expect to find that electricity has no effect upon strength, while others will be disappointed to find this influence so slight. The wires employed were very small, ranging from one-fifth to two-fifths of a millimeter in diameter. (One line is about equal to two millimeters.) A piece of each wire, one meter long, was clamped at both ends between steel plates, and thus suspended at one end while a scale pan hung from the other end, and in it were placed, at first, weights, then fine sand was poured in until the wire broke under the strain. The experiments were conducted between 68° and 77° Fah., and mostly after the passage of a current, a few, however, during its passage. Feeble currents were employed, and those as constant as possible, and with every practicable precaution. The duration of the separate experiments was almost always the same.

In every case there was an increase of strength, and when the passage of the current lasted three hours the weight requisite to break the wire was increased from twelve to ninety-two grains.

With increased time there was an increase of strength up to a certain maximum, which was attained in some wires sooner than in others. Thus wires which gained in three hours 12 to 28 grms., gained in twelve hours 23 to 44 grms., and in 25 hours 24 to 50.

With feeble currents the increase of strength for equal times was nearly proportional to the strength of the current. If the current was somewhat stronger this law did not hold any longer, owing to its heating the wire The strength seemed to be greater while the current was passing than after it was broken.

Hoffmann thinks that while this increase of cohesive power was partially due to the heat generated by the current, the galvanic current itself played its own essential part therein. A. P.

Constipation.

Hall's Journal of Health thinks it is doubtful if consumption numbers as many victims as are stricken down by the various diseases that result from habitual constipation. True consumption is an inherited disease. It may remain always dormant, but when aroused to action, decay commences at a point circumscribed, and gradually extends—unless arrested—until so much of the lungs becomes involved that vital action ceases. The evils of constipation result from inattention to the calls of nature, and usually commence with children whose habits are not closely looked to by their parents.

The processes of nature are always active while life lasts. When effete matter is retained a moment beyond the time its expulsion is demanded, the system commences its efforts to get rid of it. When the natural egress is checked, the absorbents carry the more fluid portions of the poisonous mass into the circulation, and it becomes diffused throughout the body. The more solid or clay-like portions is forced into the lower rectum, where it becomes firmly impacted, thus cutting off the circulation in the small blood vessels, causing painful engorgements known as piles and hemorrhoids. A continuance of these troubles often results in fissure, fistula, or cancer. The trouble is seldom confined here. As a result of the blood poisoning we almost invariably find more or less dyspepsia, with decided derangement of the functions of the heart, liver, and kidneys, accompanied by headache and nervous debility, often verging on paralysis.

Coal Ashes for Fertilizing.

The use of coal ashes mixed into clayey soils has been found of great benefit, and its value is vouched for by many agriculturists. The *Husbandman* reports an experiment made with coal ashes, applied at the rate of 200 bushels to twenty square rods, or ten bushels to the square rod. The soil was compact and heavy. The ashes were drawn on late in the autumn and spread on the ground, which had been recently plowed. In the spring the plowing was repeated, thoroughly mixing the ashes with the soil. The ground was planted with garden vegetables. The beneficial result was in the correction of the heavy character of the soil, the ashes acting mechanically and not as a manure, and producing a satisfactory improvement.

Newspaper Telegraphs.

The desirability of having immediate and absolute control of telegraphic facilities in certain emergencies has led to the leasing of telegraph wires by newspapers. The London *Times* has some short ones; the New York *Tribune* has a wire between New York and Washington; the leading papers of Cincinnati are similarly connected with Washington; and recently the Chicago *Inter-Ocean* has taken what is probably the longest wire leased by any newspaper, connecting its editorial rooms with its news bureau in Washington. All messages are sent direct, the paper having exclusive use of the wire and employing its own operators.

TO MAKE ICE CREAM.—Scald a gallon of good sweet milk, and add to it with constant stirring eight eggs well beaten with one pound white sugar, and four spoonfuls of corn-starch, first mixed into a thick cream with cold milk. Cool, flavor to suit, and freeze.

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BARREL MACHINERY.

[*Continued from first page.*]

Following this machine is the machine, Fig. 5, for chamfering, howeling, and crozing, which prepares the cask to receive the heads. It cuts the chamfer, howel, and croze at one operation, making a perfect groove of uniform width and depth to receive the head. This machine has a capacity of 1,500 casks per day, and will finish casks of any size from one-eighth beer kegs to large casks, and is made for this range of work when so ordered. All of these machines are well made and are of great practical value.

Dynamo-Electric Motor.

The London *Mining Journal* states that at the Mannheim Industrial Exhibition over 8,000 persons have been conveyed at the rate of nearly three miles an hour by the electric lift of Dr. Werner Siemens, of Berlin.

The lift is quite safe, the cage being suspended by two wire ropes, which pass over drums, and carry counterweights to balance the ordinary average load. To raise or lower the lift, therefore, only a slight additional power is required. This is supplied in the form of an electric current from a dynamo-electric generator on the ground, and is conducted to a second dynamo machine attached to the carriage. The propulsion is effected by means of a metal ladder or rack, which runs up the middle of the shaft or passage of the lift, and into this rack work two toothed wheels carried by the lower part of the framework of the carriage. These wheels are driven by the revolving armatures of the dynamo machine on the car by means of an endless screw. The current is led from the stationary generator to the moving one by conductors running up the sides of the ladder and two metal rollers which make contact with them, and are connected to the arma- ture of the machine. The return part of the circuit is formed of the metal wires by which the carriage is suspended.

The New South Wales Museum.

It should have been mentioned in our notice of the Technological, Industrial, and Sanitary Museum of Sydney, last week, that Messrs. Trübner & Co., 57 and 59 Ludgate Hill, London, England, will receive and forward to the museum any contributions that our merchants and manufacturers may choose to make.

RECENT INVENTIONS.

Mr. Joseph Sirnguey, of New Orleans, La., has patented an improved lock, so constructed that its keyhole may be adjusted to any desired position, thus adapting the lock to be attached to doors having key holes from former locks. The casing of the lock is provided with sliding plates in which are the keyholes, and which may be fastened permanently with screws when adjusted to the desired position. By employing two sets of plates, one of which has a barrel for a spindle-key and the other a spindle for a barrel-key, the lock may be fitted for use with any kind of key.

Mr. George F. Letellier, of Tye River Depot, Va., has invented an improved millstone dressing machine of that class which employs a pick, and may be adjusted to act from the eye to the skirt of the stone. The invention consists in improved means for tripping the pick lever for regu lating the force of the blow, and for adjusting the pick over the face of the stone to any required position.

Mr. George W. Dudley, of Waynesborough, Va., has patented a rotary engine which dispenses with valves, sliding abutments, etc., operated from the driving shaft by means of cams, eccentrics, etc. Segmental pistons are employed and a novel reversing valve is provided.

A stump puller, patented by Mr. William O. Youngblood, of Cedar Springs, Mich., consists of a frame, two levers pivoted to the frame, and having eye-bolts to receive the pulling chains to apply the power to the hitch-chain, two ropes and their guide pulleys for connecting the levers with the power, the shaft having the connecting ropes wound around it in different directions, and two rope wheels, the two draw ropes being wound in different directions around the rope wheels,

Mr. William R. Fearn, of Savannah, Ga., has patented a railroad switch which places the control of switches in the hands of the engineers or train-men. The switch levers are connected to a rod extending in both directions from the

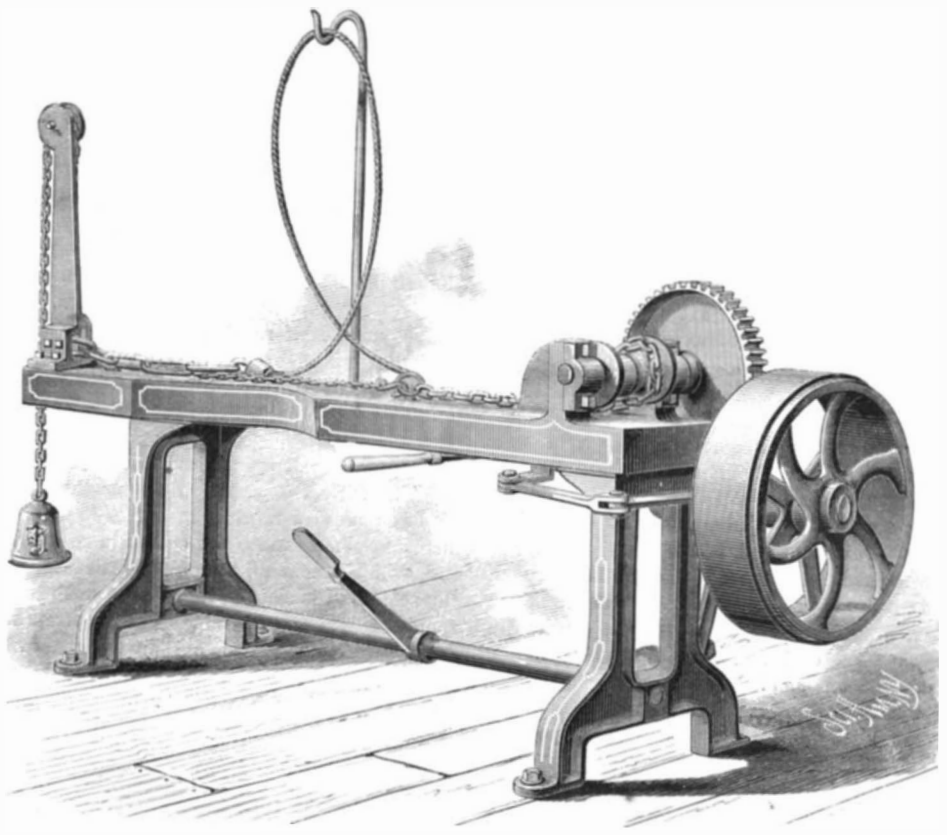

Fig. 4.—POWER WINDLASS FOR TIGHT AND SLACK BARRELS.

switch, and fitted with crank levers extending between the tracks. These levers are operated by a swinging block or key hinged to the lower end of a hanger that depends from the car or locomotive platform, and which is actuated by a lever and rod to switch the cars from one track to another as required.

Mr. John Gearon, of Beloit, Ia., has invented an improvement in scythe snaths, which consists in a scythe snath formed in three parts, halved to each other, secured at their junctions by bolts, and provided with handles. By this construction the parts are rendered adjustable to suit the convenience of the operator, and the proper position of the scythe relative to the handles is secured without the usual bending in the manufacture of the snath when formed in a single piece.

Mr. J. B. King, of St. Paul, Minn., has patented a calendar inkstand, which is simple in construction, and serves as a perpetual calendar. The inkstand has the numerals of the days of the month arranged in a table at the front, whereas

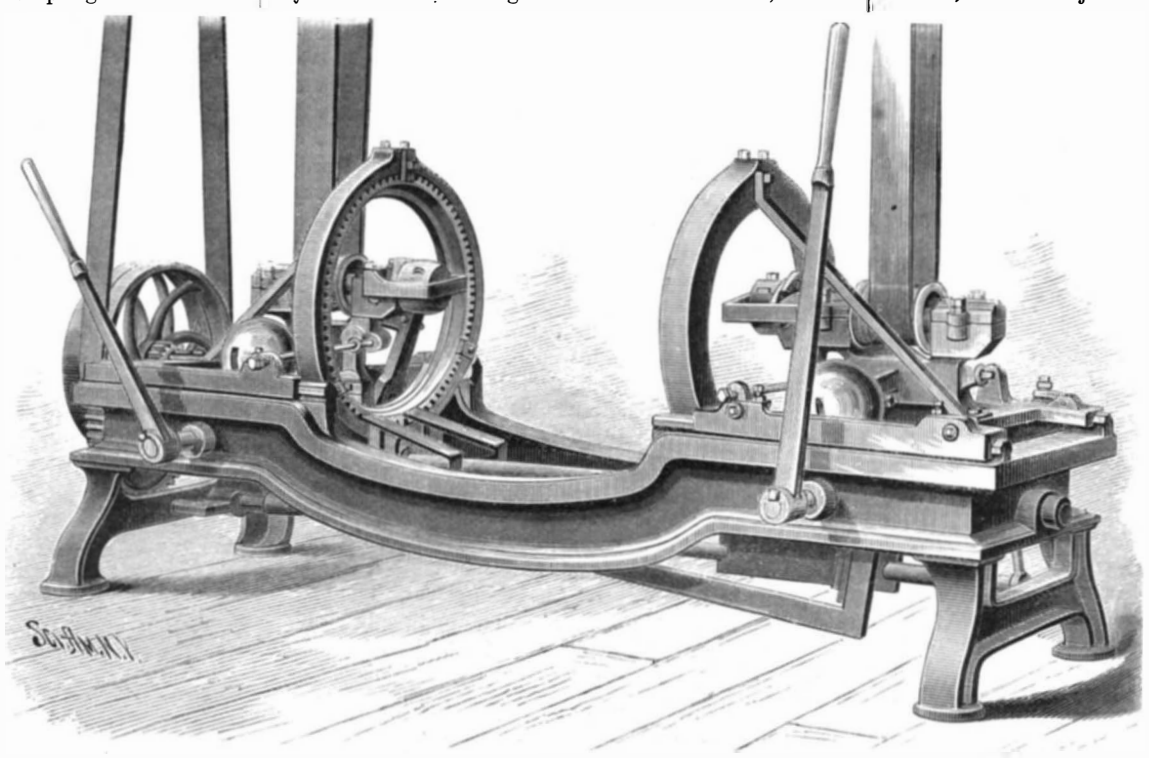

FIG. 5.—MACHINE FOR CHAMFERING HOWELING AND CROZING TIGHT AND SLACK KEGS BARRELS, AND CASKS.

the names of the days of the week and of the months are arranged on the outer surfaces of two cylindrical ink-wells fitted into corresponding chambers of the stand, each chamber being provided with a vertical slot in front, through which these names may be read

Mr. Albert G. Forster, of New York city, has patented a child's swing so constructed that the child cannot slide out of the swing while being swung and can be put into the swing quickly and easily

Mr. William H. Peyton, of Iuka, Miss., has patented a combined shovel, tongs, and pot-hook. The extremities of the legs of the tongs are made with hooks for lifting pots, etc., and when closed they form the handle for a detachable shovel, which may readily be attached or detached.

Mr. John Casey, of Jersey City, N. J., has patented a check receiver for use in restaurants, bar-rooms, and other places to receive checks handed in by customers. It not only exposes to view all the checks inserted, but also exposes, in a series, a certain number of checks last received, before they finally enter the receiver, whereby if a wrong check be inserted the error or fraud may be detected.

Mr. Andrew Climie, of Ann Arbor, Mich., has patented an improved bolt for the locks of cases and drawers in museums, etc., where a number of doors or drawers are required to be locked at the same time. He employs a series of bolts with sockets upon the sides of their bases, a series of bearings, one or more sliding rods carrying the bolts, one or more bent levers, and one or more connecting rods, by which mechanism one or more series of bolts can be simultaneously operated.

Mr. Horatio Ely, Jr., of Red Bank, N. J., has patented a railroad signaling apparatus, which consists of series of self-adjusting rocking bars secured below the rails parallel to the cross-ties, provided with arms projecting upward on the outside of the rails in position to be struck by advancing trains. Motion is communicated by wires or rods connected with the rocking bars to signals or guards in advance of the trains.

Messrs. Anthony W. Byers and James C. Dorser, of Sherman, Texas, have patented an improved cotton planter so constructed that more or less seed can be planted as desired. A slotted hopper having a slotted feed-board controlled by springs, and a spiked feed-wheel supplied with prongs and curved plates, are the principal devices employed to accomplish the end sought, these devices being adjustable.

Mr. Jasper N. Blair, of Slippery Rock, Pa., has patented a car coupling consisting of a drawbar containing two longitudinally hinged spring-actuated dogs set a little apart, with their sloping faces presented toward each other, thereby forming a central wedge shaped opening into which the coupling link can be entered, caught, and held by the shoulders at the rear of the dogs. A segmental lever is employed for throwing the dogs apart in uncoupling the cars.

Mr. Eli C. Horne, of Jasper, Florida, has patented a cotton-gin, which consists in a combination with a roller of a stationary superposed blade, yieldingly held to the face of the roll, and a subjacent reciprocating blade, having its upper edge arranged obliquely to the lower edge of the stationary blade. The cotton to be ginned is pressed by the reciprocating blade between the stationary blade and the roll, being fed thereto from a suitable feed-board.

Mr. Luther Homes, of New Orleans, La., has patented a grass-cutter so constructed as to cut the grass without any vibration or rotation of the knives as the machine is drawn forward, and which permits the knives to be readily detached and sharpened. The knives are constructed to yield to any undue obstruction. Short knives are arranged in oblique angular relation with two long knives, and the grass to be cut being drawn into the angles formed by the edges of the blades, is cut by the forward movement of the machine.

Mr. Robert J. Bowman, of Alexandria, Va., has patented an improved gang plow, planter, and cultivator, so constructed that it can readily be adjusted for either of the uses specified, and can be made equally effective and convenient in either capacity. A number of novel arrangements of detachable and adjustable devices accomplish the ends sought.

Mr. W. H. Hickok, of East Troy, Pa., has invented a ditching machine for opening blind and tile ditches. A long axle is mounted on two wheels and provided with a pole having a long double-tree. This enables the wheels and team to straddle the ditch. The mechanism is carried by the axle, and is

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very ingenious, a shovel being caused to penetrate the earth, which it raises and delivers upon either side of the ditch at will of the operator.

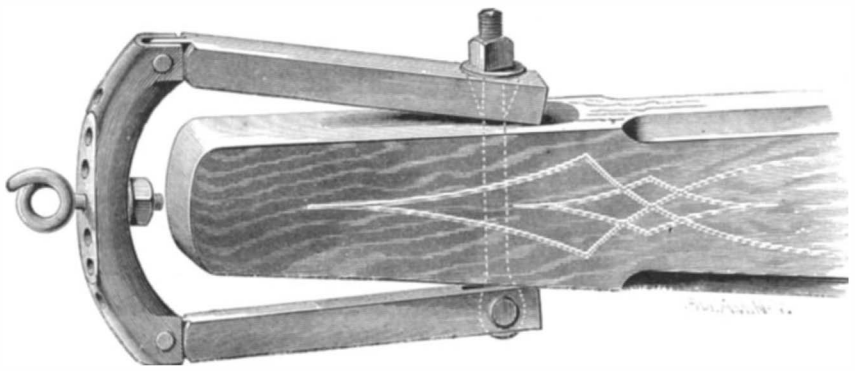
IMPROVED CLEVIS.

The clevis represented in the engraving is to be used on plows, harrows, and other agricultural implements. It may be readily adjusted to fit drawbeams of various dimensions, and may therefore be applied to any of the implements on a farm requiring a clevis. It consists of two bars hinged to opposite ends of a link, and connected with each other by a bolt which is pivoted to one of them and passes through the beam and through the other bar, and is provided with a nut which may be screwed down more or less to adapt the clevis to drawbeams of different sizes.

The curved link has several holes through it for receiving the hook to which the single tree or double-tree is attached.

This clevis may be applied to the beam horizontally, perpendicularly, or at any desired angle, either in front or at top or under the beam, as may be found most convenient.

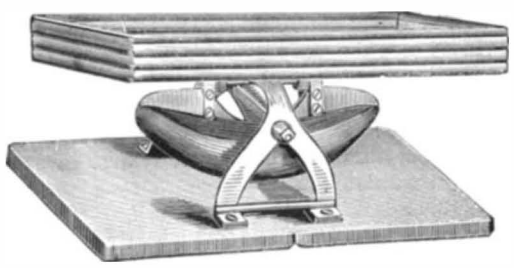
Further information in regard to this useful invention may be obtained by addressing Mr. S. K. Latta Dyersburg, Tenn.



JENNINGS' PLOW CLEVIS.

THE HUSTON SELF-LEVELING BERTH.

It is no new idea to suspend ship berths so that they will retain an even position at whatever angle the ship may be forced by the waves, and several steamship companies have tried and abandoned such devices. In the SCIENTIFIC AMERICAN of May 29, 1880, notice was made of a highly promising exhibition of the Huston ship's berth on the City of Alexandria, plying between this city and Havana. It is gratifying to know that the opinion which we then formed, with regard to the ability of the invention to overcome the causes of sea-sickness, has been justified by the behavior of the berth under a great variety of conditions at sea.



THE HUSTON SELF-LEVELING BERTH.

It will be observed from our illustration that the berth (with its occupant) is counterbalanced by a crescent-shaped weight rigidly attached to the underside of the berth, while the whole is so swung on a universal joint as to maintain a level surface no matter how the vessel may pitch and roll. The motion of the berth is also regulated by rubber bands, so that sudden or jerky movements are made impossible. As will be seen in the subjoined cut the berth takes up no more room than the ordinary ship's berth. Even those who never suffer from sea-sickness will appreciate the value of a contrivance which enables them to lie at ease in the roughest weather; while to invalids, and to those who are certain to be martyrs to the distressing *mal de mer*, the advantage of being substantially independent of the ship's motion while on board ship is beyond one's power to estimate. Obviously the plan here described can, at the best, prevent sea-sickness only while the patient is lying down. It is very desirable that some one should devise a means of preventing sea-sickness absolutely. A fortune would surely be his reward.

Launching a Ship.

Not one-half the people who witness the launching of a vessel can tell how it is done. They hear a great sound of pounding and driving of wedges for half an hour or so, then a loud shout is raised, and the ship starts slowly at first, but, gradually increasing her speed, slides with a steady, stately motion from off the pile of timber and blocks where she has been standing for months; and where but a moment before the huge creature towered aloft, nothing remains but a *débris* of timber and planks, while out on the water floats one of the most graceful works of man.

When the ship is about ready to launch, her immense weight rest principally upon blocks some eight or ten inches square on the ends, and perhaps some fifteen or eighteen inches in length. These blocks are placed directly under the keel, and in order to launch the vessel it is necessary to transfer the weight of the vessel to the way—two long lines of heavy timber reaching about two-thirds the length of the vessel on either side, and about midway the bilge or bottom. These ways are simply two lengths of timber with a thick layer of grease between them, so that as soon as the ship acquires any momentum they will slip one along the other. To transfer the weight of the vessel on to these ways, so that gravity—the stern or heaviest part of the vessel being much lower than the bow—will cause her to move, is the whole secret of launching. To do this, between the top of the ways and the vessel are driven pine wedges, which, of course, raise her somewhat, and so relieve the blocks under the keel of part of the weight resting upon them. This done, workmen take their places under the vessel, and with iron wedges cut and knock away the blocks. When these are removed, the entire weight of the vessel settles at once upon the greased ways, and the result is exactly the same as would be if a person should seat himself upon a sled pointing downhill upon an icy slope—away she goes!

There seems to be a strange sort of fascination for most people in the launching of a large vessel, and in our shipbuilding ports it is not uncommon for a thousand persons to be present to enjoy the spectacle.—*George Bancroft Griffith, in Potter's American Monthly.*

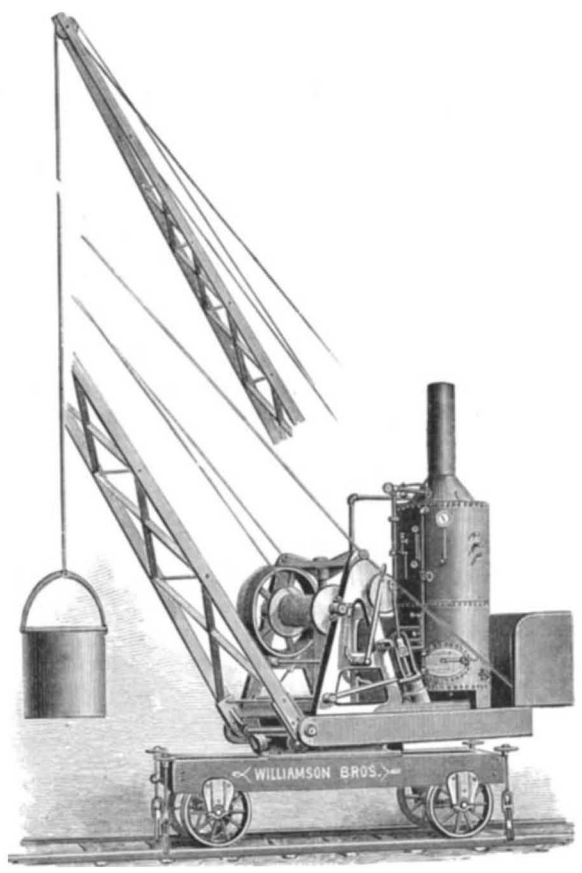
IMPROVED STEAM CRANE.

Handling heavy or bulky articles by sheer muscular force is becoming almost as rare where a great deal of lifting is required as it once was to handle unwieldy objects by steam, and in almost every place where any considerable amount of hoisting, loading, and unloading is required to be done, there steam is employed.

Our engraving shows a steam crane designed and built by Williamson Brothers, Richmond and York streets Philadelphia, Pa., for the Edgar Thomson Steel Works. It is suited to unloading cargo, and has a double engine, which communicates motion to the winding drum through friction gearing. This gearing, which is very simple, has been successfully applied to a large number of cargo hoisting engines for ship use by this firm. One lever controls the hoisting, stopping, and lowering of the load.

The crane is revolved on its base by a double cone friction clutch, which admits of turning the crane in either direction without reversing the engine.

The carriage and the base on which the engine and boiler rest are both made of wrought iron. The jib, which is of wrought iron, is made longer than usual to meet the particular work for which the crane is designed.



WILLIAMSON BROTHERS' STEAM CRANE.

The engines of this crane are 6 bore, 8 stroke, and develop 12 horse power. The machine complete weighs about 7 tons

Messrs. Williamson Bros. make similar locomotive cranes suitable for light or heavy work, with spur gear for hoisting, revolving, traveling, and altering the radius of the jib, and their large experience in this class of machines enables them to construct hoists adapted to any purpose for which they may be required.

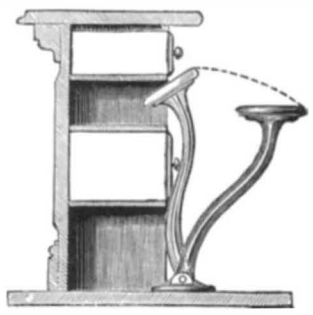
A SEAT FOR SHOP GIRLS.

Scarcely a season passes without a general protest against the common rule in our retail shops requiring saleswomen to stand at all times, even when not serving customers. Physicians have denounced the custom as health-destroying and cruel; ladies have combined to secure its abolition by withholding their patronage from shops in which the girls are not allowed to sit; and our daily newspapers have repeatedly inveighed against the practice and called for its abolition. Still it prevails; not because of any hard-heartedness on the part of shopkeepers, but for purely practical considerations. In the limited space between counters and shelves there is no room for fixed seats of the usual construction, and movable stools would be still more in the way. To widen the space so as to make room for stools would only increase the labor of those who have to handle the goods.

As in most cases of inconvenience and suffering, so in this, it is not the philanthropist or the sentimentalist who must be looked to for a remedy, but the inventor.

What is required is a seat which shall be simple, inexpensive, always at hand when wanted, and able to take itself out of the way when it is not wanted. A step in this direction has been made by an English inventor, who has patented the seat shown in the illustration herewith. The curved iron support carries a plain round seat of wood, and is hinged in the foot plate so as to be easily brought forward to be used or shut back against the counter when the attendant has to stand. It takes up but little room, and is evidently handy and serviceable.

It would be easy to make a stool for the same purpose that would take up still less room and be entirely automatic. The standard should be set in a narrow slot or recess in the counter, and the seat pivoted off the center so as to drop edgewise and enable it to fit into the slot for the standard. The foot-plate would thus be entirely out of the passage, and the seat top nearly so, when not in use. A bit of rubber under the forward part of the hinge of the base to be compressed when the seat is in use would suffice to swing the seat into its recess the moment the attendant rises. By this arrangement the seat top would not be in the way of drawers or shelves, as in the English plan; and the much desired relief would be afforded to the saleswomen with the least cost of counter space and no obstruction of the passage way.



Seat for Shop Girls.

We look to our enterprising makers of counters and other shop fittings to introduce some improvement of this sort.

Fatal Discipline.

Archibald Gibson, Second Lieutenant Seventh U. S. Cavalry, died in St. Paul, Minn., January 26. The cause of his death was inflammation of the brain, said to have had the following curious origin. One day, while he was on parade at West Point, a spider got into one of his ears. By the rules, he was not allowed to raise his hand, and stood in the ranks more than an hour, while the spider worked his way into the ear. When dismissed his ear was full of blood, and the insect could not be removed for two days. The injury caused him much trouble, but did not prevent his assignment to his regiment in Northern Dakota. After some service, Lieutenant Gibson returned to his home in St. Paul, intending to resign, but, really, to die. His death is charged to inflammation of the brain, caused by necrosis of the inner wall of the skull adjoining the ear, the result of the spider's invasion.

A Great Drainage Project.

It is reported from Florida that an agreement has been entered into between the State authorities and certain Northern and Western capitalists to drain Lake Okeechobee and the great swamp region southward-known as the Everglades. The lake is about thirty miles by forty, and the entire area to be reclaimed is nearly twice as large as the State of New Jersey. The projectors claim that the drained land will make the best sugar country in the world. How they propose to accomplish the work is not stated. So long as the South has so much waste land suitable for sugar growing, without drainage, an undertaking of the sort described would seem to be rather speculative than practical.

How to Use Oil Stones.

Instead of oil, which thickens and makes the stones dirty, a mixture of glycerine and alcohol is used by many. The proportions of the mixture vary according to the instrument operated upon. An article with a large surface, a razor, for instance, sharpens best with a limpid liquid, as three parts of glycerine to one of alcohol. For a graving tool, the cutting surface of which is very small, as is also the pressure exercised on the stone in sharpening, it is necessary to employ glycerine almost pure, with but two or three drops of alcohol.

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ELECTRO-METALLURGY.

GOLD DEPOSITS.

In the practice of electroplating with gold the bath employed is usually heated, as the deposits obtained in such a bath are more homogeneous, tenacious, and durable, and of a better color, besides which recommendation a greater quantity of the metal may be deposited satisfactorily from it in a given time than from a cold bath.

Owing to the cost of the metal to be deposited very large surfaces are rarely required to be electroplated, and as these baths become worn out and must be replaced by fresh solutions after a short time, they are usually, as a matter of economy and convenience, used in as small a vessel as the circumstances will admit of. These vessels may be of glass, porcelain, or porcelain-enameled iron. The latter serve the purpose admirably (if the enamel is good). They should be heated over the water bath or by means of steam.

The same bath does not answer very well for all metals—either the bath must be modified to suit the metal or the latter must be previously coated with another metal to suit the conditions. Gold deposits are obtained with the greatest facility upon silver or copper, their rich alloys, or other metals coated with them. With these a hot bath (at about 170° F.) and a moderately strong current give good results. With alloys, such as German silver, the best results are obtained with a weak bath, barely warm. Steel and iron, when not coated with copper, require an intense current and a very hot bath. Lead, zinc, tin, antimony, and bismuth alloys of, or containing much of these, are preferably coated with copper before electro gilding.

HOT BATHS.

For silver, copper, or alloys rich in these:

Distilled water	1 gallon.
Phosphate of soda, cryst	9½ ounces.
Bisulphite of soda	1⅗ "
Cyanide of potassium, pure	½ "
Gold chloride	160 grains.

Dissolve in a portion of the water, heated, the phosphate of soda. Dissolve in another portion of the water the bisulphite of soda and cyanide of potassium.

Dissolve the gold chloride in the remaining water, stir the solution slowly into the cold phosphate of soda solution, and finally add the solution of cyanide and bisulphite. The bath, now ready for use, should be colorless.

The cost of this bath is about $5 a gallon, and the metal can be deposited from it profitably at $2 per dwt. Used at a temperature of from 120° to 175° Fah.

BATH FOR IRON AND STEEL—UNCOATED.

Distilled water	1 gallon.
Phosphate of soda, cryst	7⅘ ounces.
Bisulphite of soda	2 "
Cyanide of potassium, pure	⅗ drachm.
Gold chloride	160 grains.

Dissolve as before. Heat to 175° or 180° Fah. Pass the second metal through the hot potash, then through dilute muriatic acid (acid 1, water 15), brush, and connect at once. Requires a very intense current at first.

The following baths work well with bronze and brass, but are not suited for direct gilding on iron or steel:

Distilled water	1 gallon.
Phosphate of soda, cryst	6⅖ ounces.
Bisulphite of soda	1⅗ "
Bicarbonate of potash	⅘ "
Caustic soda	⅘ "
Cyanide of potassium, pure	½ "
Gold chloride	⅗ "

Dissolve all together, except the gold chloride, in the hot water; filter, cool, and gradually stir in the gold chloride dissolved in a little water. Heat from 120° to 140° Fah. for use. It requires an intense current.

Distilled water	1 gallon.
Ferrocyanide of potassium	5½ ounces.
Carbonate of potash, pure	1¾ "
Sal ammoniac	⅘ "
Gold chloride	⅔ "

Dissolve as in the last, boil for half an hour, replace the evaporated water, and the bath is ready for use.

Distilled water	1 gallon.
Cyanide of potassium	2⅘ ounces.
Gold chloride	1 "

Dissolve the gold chloride in the water, then add the cyanide, and stir until solution is complete.

Baths of this kind are commonly used, and with little regard to temperature. They are simple in preparation, but are, unfortunately, not very uniform in their working, ungilding one part while another is gilding, and producing a variety of colors, especially when freshly prepared. They improve by use, however.

COLD ELECTRO GILDING BATH.

Water, distilled	1 gallon.
Potassium cyanide, pure	3½ ounces.
Gold chloride	3/10 "

Dissolve the cyanide in a part of the water, then gradually add the gold chloride dissolved in the remainder. Boil for half an hour before using. (Use cold.)

The cold bath is kept in a gutta percha lined, wooden, or (if small) porcelain tank arranged as for brass plating. The anodes are thin plates of laminated gold, wholly suspended in the liquid (while in use) by means of platinum wires, from clean brass rods joined to the copper or carbon pole of the battery, the rods supporting the work being in connection with the zinc. When in proper working order the color of the deposit is yellow. If the deposit becomes black or dark-red, add more cyanide (dissolved in water) to the bath, or use a weaker current.

If the cyanide is in excess the plating will proceed very slowly or not at all; or, as sometimes happens, articles already gilded will lose their gold. In such cases add a little more gold chloride or increase the intensity of the current.

Cold electro-gilding must be done slowly, and requires a good deal of attention to secure good work. The articles must be frequently examined to detect irregular deposits or dark spots (which must be scratch-brushed and refurned). It is also frequently necessary to add to or remove an element from the battery, especially when adding or taking work from the bath. With too much intensity of current the deposit is black or red; if too weak those portions opposite the anode only get covered. In coating German silver it is necessary to use a weak bath and a small exposure of anode. The best results with this alloy are obtained when the bath is slightly warmed.

MANAGEMENT OF THE HOT BATH.

The articles should be kept in agitation while in the bath. They should be placed in connection with the battery before or immediately upon entering the bath. A foil or wire of platinum is in many cases preferable to a soluble gold anode when electro-gilding by aid of heat. It suffers no alteration in the liquid, and by its manipulation the color of the deposit may be materially altered. When it is removed so as to expose only a small surface in the bath a pale yellowish deposit may be obtained; when the immersion is greater, a clear yellow; with a still greater exposure, a red gold color. The strength of the hot baths may be maintained by successive additions of gold chloride with a proper proportion of the other salts and water; but it is preferable to wear out the bath entirely and prepare a new one, as it soon becomes contaminated with copper or silver if much of these metals have been gilt in it. In a nearly exhausted bath containing dissolved copper the electro deposit will be what is called "red gold;" if it contains an excess of silver a "green gold" deposit will result. The gold and copper or gold and silver are deposited together as an alloy, the color of which depends upon the relative proportion of the metals, battery strength, etc.

Dead luster gilding is produced by the slow deposition of a considerable quantity of gold, by giving the metallic surface a dead luster before gilding (by means of acids), by first preparing a coating of frosted silver or by depositing the gold upon a heavy copper deposit produced with a weak current in a bath of copper sulphate.

In order to secure a good deposit of gold it is absolutely necessary that the work should be perfectly freed from any trace of oxide, grease, oil, or other impurity. Articles of copper and brass may be cleansed by first immersing them in a strong boiling solution of caustic potash or soda, and, after rinsing, dipping momentarily in nitric acid and immediately rinsing, or scouring with pumice stone moistened with a strong solution of cyanide of potassium in water.

Other metals require a somewhat different treatment, which we will have occasion to refer to in a subsequent article.

The bichromate battery is commonly used in connection with hot electro-gilding baths. See article on nickel-plating, p. 153, No. 10, vol. xliii.

As gold chloride procured in the market cannot always be depended on for purity and strength, it is preferable to purchase the gold and make the chloride. A pure gold chloride may be prepared as follows:

Put coin gold, in small pieces, into a glass flask with about five times its weight of aqua regia (nitric acid 1, hydrochloric acid 3), and heat gently, with small additions of aqua regia if necessary, until the gold is dissolved and the silver remains behind as white chloride. Let it settle, decant the clear solution, wash the residue several times with water, adding the washings to the gold solution. Evaporate off excess of the acids in a porcelain dish over a water bath (nearly to dryness). Dilute with ten parts of water, and gradually add a strong aqueous solution (filtered) of sulphate of iron. Let stand until the dark powder (gold) settles; gently decant the liquid, wash the gold with hot water, and redissolve it in a small quantity of warm aqua regia and evaporate the solution, with constant stirring, to dryness in a porcelain dish over the water bath. One ounce of pure gold equals about 1 6/10 ounce of this chloride.

The Work of the Patent Office in 1880.

The annual report of the Commissioner of Patents for the year ending December 31, 1880, gives the business of the year as follows: Applications for patents for inventions, 21,761; applications for patents for designs, 634; applications for reissues of patents, 617; total, 23,012. Patents issued, 13,441; patents reissued, 506; patents expired, 3,781; trade-marks and labels registered, 533.

Of the 13,441 patents issued during the year, 12,655 were to citizens of the United States, and 786 to foreigners.

There was received during the year for patents, copies of records or drawings, and from other sources, an aggregate of $749,685.32. The total amount expended was $538,865.17, leaving a balance of $210,820.15. On January 1, 1880, there remained $1,420,806.56 to the credit of the Patent Fund, which, added to the surplus of 1880, makes the amount to the credit of the Patent Fund on January 1, 1881, $1,631,626.71.

Our Export of Breadstuffs.

The official report of the exports of breadstuffs in 1880 shows the largest movement ever recorded, both as to quantity and as to value, except during the fiscal year which embraced the first six months of 1880. Reducing flour and meal to wheat and corn, at the approximate rate of five bushels to the barrel, the quantities exported for the last two years may be stated thus:

	Quantity.		Average Price.	
	1880.	1879.	1880.	1879.
Flour, barrels	6,545,920	5,885,831	$5.82	$5.53
Meal, barrels	384,177	340,969	2.93	2.60
Wheat, bushels	134 701,146	137,975,715	1.20	1.16
Corn, bushels	105,717.215	83,144,845	55	49
Rye, bushels	2,346,995	4,445,030	92	69
Barley, bushels	1,246.640	1,103.514	65	61
Oats, bushels	544,294	1,048,934	45	34
Wheat and flour, bush'ls	167,430,746	167,404,870		
Corn and meal, bushels.	107,638,100	84,849,690		
All grain, bushels	279,206,775	258,852,038		

Correspondence.

The Sun Dogs of Colorado.

To the Editor of the Scientific American:

In the SCIENTIFIC AMERICAN, dated January 22, appears a letter from Jerseyville, Ill., written by F. S. Davenport, in which, after describing the remarkable sun dog phenomena of December 30, 1880, he inquires if any one had ever seen the like before. Colorado was almost wild over such a phenomena, December 23, 1876. In this case it began at sunrise. The thermometer indicated all the way from ten to twenty-two degrees below zero. The atmosphere was suffused with a myriad of crystalline particles. The horizontal rays of which Mr. Davenport speaks encircled the entire horizon, and had in it four additional sun dogs the greater part of the day, and at times eight. Instead of being one circle around the sun, we had two, the inner one bright, the outer one fainter. The upper arc of the outer one touched the arc of the brilliant prismatic crescent in the zenith. This crescent was brighter at that time than the sun, and could be looked at only a short time on account of its extreme brilliancy. The sky within the circle which the crescent would have formed, if complete, was a deep blue and very beautiful. Full descriptions were given in all of the Colorado papers, while the Denver *Tribune* gave a cut representing it partially.

The spectacle lasted until three o'clock, though it was brightest at about eleven. An additional halo, somewhat like a rainbow, was visible in the western heavens at about sunset.

A similar phenomenon, though not near so bright, was witnessed some time last December.

Boulder, Col. OTTO H. WANGELIN.

Corundum Localities of Georgia.

The corundum outcrops of Georgia are widely separate. In the northwest part of the State, in Towns County, and southwest of the corundum locality in Clay County, North Carolina, is an outcropping of corundum, a portion of which is of reddish color. Here a good amount of work has been done, with what success I am unable to say. The matrix of this corundum is smaragdite, called by some distinguished mineralogists kokscharoffite. The composition of the two are similar, except that smaragdite contains the oxide of chromium, which is probably the coloring matter of the corundum. The matrix of corundum is usually some one of the varieties of chlorite; that of the precious gems, the ruby, sapphire, etc., is ripidolite. I doubt whether the colored varieties can be found only in connection with chrome. Southwest of this are several outcrops of corundum extending nearly to the line of Alabama; also one or two in the eastern part of the State, none of which are at present mined.

The only outcrops of corundum in Alabama are found lying between the waters of the Coosa and Tallapoosa rivers in Tallapoosa County. These mines are worked by the Hampden Emery Company, of Chester, Mass. The annual yield is small.

Throughout the United States, as yet, no localities have been discovered with the corundum disseminated through the spinel, making emery like that of Naxos and Turkey.

Geologically considered the corundum seems to occur in belts associated with the magnesian minerals, and is usually found in the outcrops of serpentine and crysolite. From Dudleyville, in Alabama, it extends northeast through the northwest part of Georgia into the mountains of North Carolina, where the largest development occurs. Passing through the Blue Ridge it continues in a northeastern course through the State, similar to the gold and other metalliferous and mineral belts. There is another belt passing through the eastern part of Georgia into South Carolina.

Judging from the present development of corundum, no sufficient quantity can be had to take the place of emery.

(MRS.) H. A. BURDICK.

THE *Victorian Review*, the leading monthly of Australia, published at Melbourne, and one that compares favorably with our best home magazines, after mentioning a number of illustrated industrial subjects which had attracted the editor's special attention, concludes as follows:

"In fact, nothing rare, or curious, or useful, in the worlds of nature or of industry, seems to escape the conductors of the SCIENTIFIC AMERICAN."

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The Machinery of the Future and the Well-being of Society.

Mr. C. C. Coffin has completed his course of six lectures before the Lowell Institute, and to the Boston *Advertiser* we are indebted for the following extract from the closing lecture of the interesting series:

The topic under consideration was: "The Machinery of the Future and the Well-being of Society." In his opening remarks the lecturer alluded to the value of the patent law, and showed how it had stimulated invention to a high degree, and claimed that invention is an educator, and the American mechanic is a thinker. His superior intelligence is acknowledged abroad. Gladstone fells his trees with an ax of American manufacture, not because its edge is any keener than those of English make, but because of the adaptability of the implement in lightness and effectiveness. In the opinion of Mr. Coffin China will not cease to be a market for our manufactures, although the Chinese may establish manufactories. Continuing, he said: Great as has been the advance of the last fifty years, it is within the bounds of probability and reason to expect greater progress during the years immediately before us. As yet we know very little of the energy of nature—what it is—its convertibility, gravitation into chemical affinity, magnetism, electricity into light and heat, and all into motion. It is thirty-eight years only since Joule made the discovery that they are one and the same. How great the progress! Yet we may confidently expect that discovery and invention will be quite as marvelous in coming years.

Five years ago the *telephone*—now the photophone, sending oral messages along a ray of light, with clear and distinct enunciation! The next application of the energy of nature for the promotion of our comfort, happiness, and general well-being promises to be the utilization of the electric light. The lecturer traced the history of its development, and said the cheapness of the machinery will allow of its adoption in a great number of country villages—requiring only a small steam engine, a generator, and the extension of the wires. Especially will this be the case in our New England manufacturing villages, where the power is derived from the streams, the erection of a water wheel and a generator being all the machinery required. It is one of the marvels of science that Lowell, Lawrence, and Manchester may be lighted by the water of the Merrimac—by gravitation—with no consumption of any material, no loss of energy! Think of a wire extending from this hall to Niagara, and ourselves sitting here in the radiance generated by the energy of that torrent! It is not fancy, but altogether practicable. In the future sewing machines will be worked by turning a button or pressing a spring, taking the power from the same mill which is to furnish light, and we shall use magnetic elevators. It is quite probable that the introduction of the electric light will be followed by the use of gas for heating and cooking.

Referring to science, in its application to war, the lecturer said: I am not sanguine in any expectation that there is to be any immediate disbanding of great standing armies in Europe; but rifled cannon, repeating small arms of long range, effective a mile away, the multiple gun, have revolutionized warfare. What is beyond we do not foresee, but on land as well as the ocean we may confidently expect that science and invention will in time bring about a new order of things, and men, instead of shouldering the musket during the best years of their life, as in France and Germany they are now compelled to do, will give their strength and energy to the arts of peaceful life. The lecturer next alluded to the growth of population and wealth during the last fifty years, and proved that the poor man of to-day has vastly more than it was possible for the poor man of 1830 to obtain. He may not be in possession of any riches when he reaches the end of life, but his burden through life is not so weighty as it was a half century ago. We cannot foresee what discovery may yet develop of nature's energy in other directions, but at the present, and probably for many years, the human race will use the forces imprisoned in coal as the most available. The coal area of the world is thus divided: Europe aggregates about 3,500 square miles, Great Britain 5,400, while North America has an area exceeding 300,000 square miles! That of England is less than the area of Massachusetts. It is estimated that at the present rate of consumption there is coal enough in England to last 1,000 years. If with 5,000 square miles of coal lands Great Britain has such an extended lease of life, what shall we say of this continent, with between three and four hundred thousand square miles of coal? We gauge the future by what we know of the past and present. Five thousand square miles of potential energy in the coal fields of Great Britain; one thousand years her lease of life! Three hundred thousand square miles of potential energy on this continent, and our expectation of life—who can tell us what it is? We are fifty millions to-day; ten years hence we shall number seventy, and at the close of the century ninety millions. What shall we be one hundred years hence? what one thousand years?

Cement for Leather.

One who has tried everything, says that after an experience of fifteen years he has found nothing to equal the following as a cement for leather belting: Common glue and isinglass, equal parts, soaked for ten hours in just enough water to cover them. Bring gradually to a boiling heat and add pure tannin until the whole becomes ropy or appears like the white of eggs. Buff off the surfaces to be joined, apply this cement, and clamp firmly.

The Improvement of Erie Canal.

After speaking at length of the successful operation of the Erie Canal during the past year, and the importance of the canal to the prosperity of our State, the State Engineer recommends the following means for improving that water way and saving the trade we now owe to it. He says:

The British are so confident that they will wrest the trade of the West from us that they have nearly completed works that will cost more than $30,000,000. This is in addition to about $20,000,000 spent in early improvements, making about $50,000,000 paid out to gain the great prize they seek—the control of the carrying trade from the heart of our country to the markets of the world. They do not fear our railroads. While we are neglecting our water routes they spare no cost to perfect theirs. This is the greatest danger that threatens our commerce. It concerns all classes of citizens and all methods of transportation.

In view of this great danger it is our duty to consider how we can save the commerce New York has so long held. We should see first how we can cheapen transportation by the American water route, consisting of the great lakes, the Erie and Oswego Canals, and Hudson River. The larger the vessel the less the cost of carrying. If our waters admit of vessels drawing even a single foot more than can pass the Welland Canal we shall have a great advantage over the British route. By removing the obstructions in the natural channels between the great lakes, and by deepening Buffalo Harbor, twenty feet of water can be gained, while the locks on the Welland Canal will only admit of vessels drawing thirteen and one-half feet. The United States Government is engaged in deepening these channels, and our representatives in Congress should see to it that this work is accomplished in time to offset the advantages which the British will gain from the enlarged Welland and St. Lawrence Canals. The State of New York does not ask of the United States Government any assistance in maintaining or enlarging its canals. It only asks that the tide waters of the Hudson River and the natural channels between the great lakes shall have the consideration which is due to them as the great channels of commerce of our country. That large vessels can carry their cargoes cheaper than small ones is seen by the fact that vessels carry grain from Chicago to Buffalo for one-half the cost of carrying it from Buffalo to New York, although the former distance is twice the latter. It is four times as expensive to transport grain upon the Erie Canal as it is upon great bodies of water.

In order to cheapen transportation upon the Erie Canal the boats must be able to carry larger cargoes, and to bring this about we should make the canal deeper. If one foot of water is added to the depth of the canal by raising its banks, the present boats can carry fifty tons additional load, and the relation between the size of the boat and the size of the canal will not be disturbed. This increase in depth would enable the boats to carry one-fifth more cargo. At the present rate of carrying it would cheapen transportation one cent a bushel, which would be equivalent to removing tolls. This plan of deepening the canal recommends itself to the boatmen, because it requires no outlay on their part, the boats now in use having a capacity for fifty tons more than the present depth allows them to carry. If no additional load was carried this increase of depth, with the application of power to the locks for operating the gates and drawing the boats in and out, such as is in use in New Jersey on the Delaware and Raritan Canal, would enable boats to make thirty-seven hours better time in a round trip from Buffalo to New York. This gain in many instances would allow boatmen to make another trip a season. There is no sentiment in trade. Business goes where it can be done the cheapest, and the route that can carry for a few mills less per bushel than any other will command it. The average freight (not including tolls) a bushel of wheat from Buffalo to New York during the past season has been five and a half cents. If this charge could be reduced to four and a half cents the Erie Canal could offer such economical transportation that there would be very little danger from its northern rival. I have had careful surveys made for the raising of the banks of the canal one foot and for furnishing the necessary water; these show that the work can be done for about $1,000,000. The gain that this improvement would have made in transportation during the past season would be equal to the cost of the work.

Walls and Beams.

One precaution that is very seldom taken with high buildings is so supporting the timbers of the floor that, in case they break or fall, they shall not pry the wall over inward, and that in case they expand they will not push it over outward. As ordinarily constructed, holes are left in the walls, into which the ends of the joists are set, the holes being about the size of the ends of the joists, so that in case the floor falls the timbers are apt to tumble the walls inward on the contents of the building. The *Paper Trade Journal* suggests two ways of getting around this. One is to set the end of the joist upon a corbel or projection from the face of the wall, so that the joist clears the face of the wall entirely, and in case it falls it exerts no influence upon the wall. The other method has the same object in view, and accomplishes it in a simpler way. The holes made to receive the joists are made about twice as high as the joists, so that in falling the joist has no prying effect upon the wall. These remarks apply to iron as well as wooden beams; but for iron beams there should be observed the additional precaution to leave a greater space between the end of the beam and the wall, so that the inevitable expansion of the beam from fire shall cause no thrust outward, tending to overthrow the walls. It would perhaps be as well if all external walls were held together by anchor bolts with external plates, which, although not very sightly, yet often tend to hold the wall up when otherwise it would topple and fall outwards. Of course, if the beams are properly cased below with some fireproof material or by some heatproof method, their expansion will be very much less than if they are left naked to the action of the heat.

The "Jumpers" of Maine.

Dr. George M. Beard, in a paper read before the American Neurological Association, records some curious facts in regard to a singular class of persons whom he met in the region of the Moosehead Lake, Maine, and who are known in the language of that region as "Jumpers," or "Jumping Frenchmen." These individuals are afflicted with a peculiar nervous affection which manifests itself by sudden and explosive movements of the body under the influence of external excitation, by a passive submission to orders authoritatively given them, and by an irresistible desire to imitate the action of others. The person thus afflicted jumps at the slightest sudden touch, and when an order is given him in a loud, quick tone he repeats the order and at once obeys. If, for instance, on the shore of a river he be ordered to jump into the water, he exclaims "Jump in," and at once executes the order. If he is told to strike one of his companions he exclaims, "Strike him," and the act follows the words.

Dr. Beard made the following experiments with one of these persons, who was twenty-seven years of age: While sitting in a chair with a knife in his hand, about to cut some tobacco, this man was struck sharply on the shoulder and told to "throw it." Almost as quick as the explosion of a pistol the knife was thrown and stuck in a beam opposite; and at the same time he repeated the order, "Throw it," with a certain cry as of terror or alarm. A moment after, while filling his pipe, he was again slapped on the shoulder and told to "throw it." Immediately he threw the pipe and tobacco on the grass, at least a rod away, and with the same suddenness and explosiveness of movement as before. Whenever this man was struck quietly and easily, and in such a way that he could see that he was to be struck, he made only a slight jump or movement; but when the strike was unexpected he could not restrain the jumping or jerking motion, although the cry did not always appear. Like experiments were made on other individuals of different ages with the exhibition of the same peculiar phenomena.

Dr. Beard classes this "jumping" as a psychical or mental form of nervous disease, of a functional character, its best analogue being psychical or mental hysteria—the so-called "servant-girl hysteria," as known to us in modern days, and as very widely known during the epidemics of the Middle Ages. Like mental or psychical hysteria, the jumping occurs not in the weak, or nervous, or anæmic, but in those in firm and unusual health; there are no stronger men in the woods, or anywhere, than some of these very "jumpers." Dr. Beard regards the disease as probably an evolution of *tickling*. Some, if not all, of the "jumpers" are ticklish—exceedingly so—and are easily irritated when touched in sensitive parts of the body. It would seem that in the evenings, in the woods, after the day's toil, in lieu of most other sources of amusement, the lumbermen have teased each other by tickling and playing and startling timid ones, until there has developed this jumping, which, by mental contagion, and by this practice, and by inheritance, has ripened into the full stage of the malady as it appears at the present hour. The malady is fully as hereditary as insanity, or epilepsy, or hay fever. Dr. Beard in four families found fourteen cases, and by the study of these it was possible to trace the disease back at least half a century. The malady seems to be endemic, confined mainly to the north woods of Maine and to persons of French descent, and it is psycho-contagious, that is, can be caught by personal contact, like chorea and hysteria.

A Large Order for Locomotives.

Recently the Baldwin Locomotive Works received from the Denver and Rio Grande Railroad Company an order for 144 locomotives, an increase of equipment made necessary by the southern extension of the road. This is said to be the largest order for locomotives in one block ever placed. The cost of the locomotives will be over $1,000,000. The work will be done during next summer and fall.

New Explosive Compound.

This compound, by J. M. Lewin, Paris, said to possess more explosive force than all other explosive materials, and which will not explode when a flame is applied to it, or in consequence of an ordinary blow, but only by means of a cartridge or capsule, consists of the ingredients given below in or about the proportions specified; *i. e.*, nitro-glycerine, 60 parts; nitrate of potassium, sodium or ammonia, 16 parts; palmitic acidulated oxide of cetyl (cetoceum), 1 part; carbonate of lime, 1 part; lignine, 1 part; and wood or animal charcoal or peat moss (sphagnum), 16 parts.

The Growth of New York City.

As shown in the statistics of the Department of Buildings the growth of New York was more rapid last year than in any twelvemonth since 1872, when the speculative building mania reached its height. That year the expenditure on buildings was not less than $27,000,000. In 1877 it was less than half as much. It increased to sixteen and a half millions in 1878. The figures for 1880 show an expenditure of $24,000,000 for new buildings.

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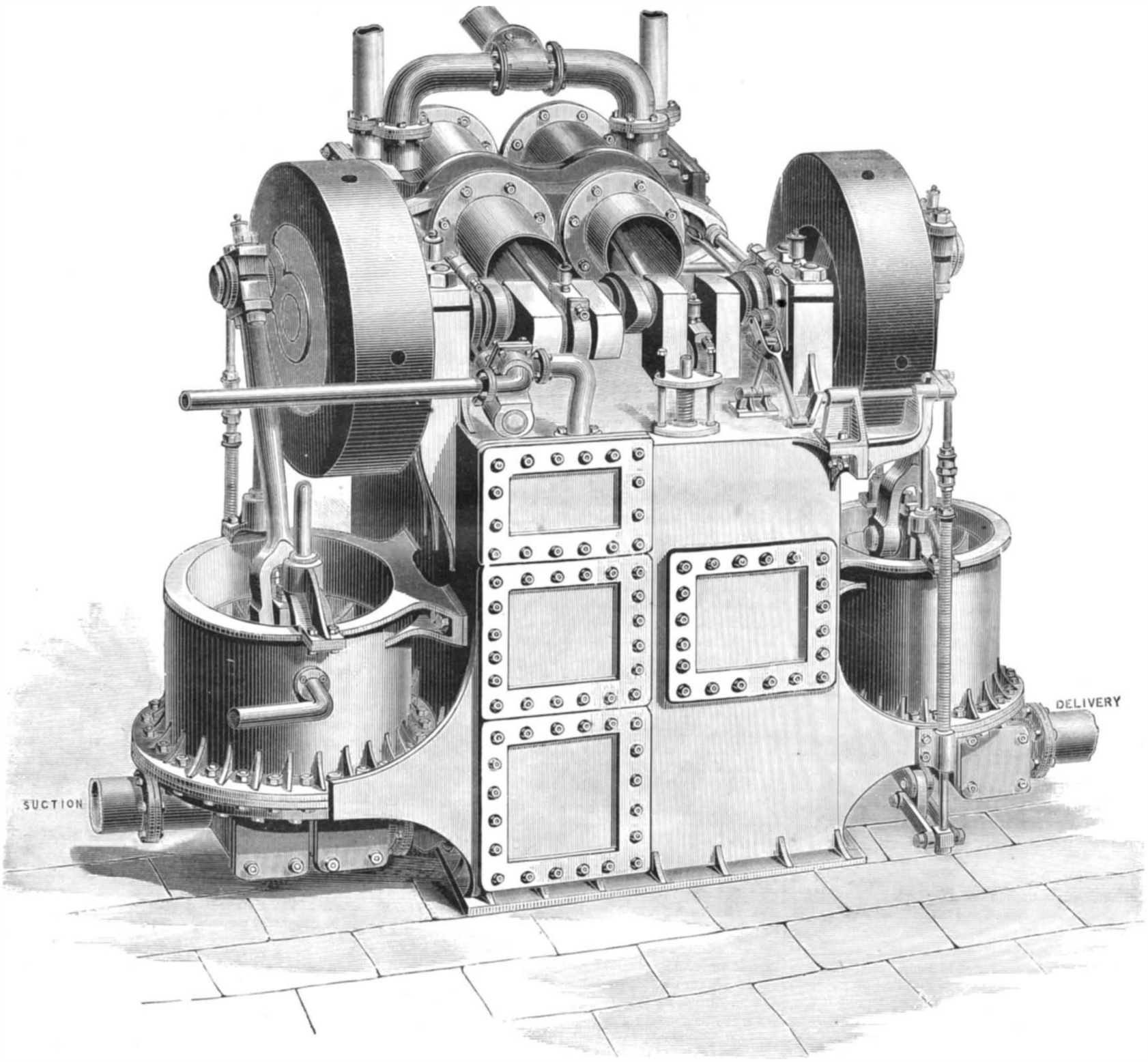
IMPROVED AIR REFRIGERATING MACHINE.

We illustrate a machine constructed by Messrs. Hall, of Dartford, for use in the Australian meat trade. The engraving is very nearly self-explanatory.

The machine consists of a pair of horizontal trunk engines, mounted on the top of a condenser. To one side is bolted a compressing cylinder, 27 inches diameter and 18 inches stroke. To the other side is bolted the expansion cylinder, 22 inches in diameter and 18 inches stroke; both these cylinders are open-topped. The valves are placed in the bottoms of the cylinders, and are worked by cams on the crank shaft and levers. Air is drawn into the compressing cylinder on the up stroke, and delivered on the down stroke, into the surface condenser at a pressure of about 50 lb. to 55 lb. on the square inch. The air here parts with its heat in the condenser, and it is then delivered into the expansion cylinder, the valve of which cuts off at about one-fourth stroke. The expanded air is then delivered through a pipe into the room to be cooled. About fifty per cent of the work expended in the compressing cylinder is returned in the expansion cylinder, the difference being made up by the engine. The machine is but one of several Messrs. Hall have in hand of different patterns. The outline diagrams show the form which they recommend for ordinary use, the height being kept down to render it specially suitable for use between decks, but the machine can be made to take any form almost, and can be made of any dimensions to suit particular requirements. The condenser, or refrigerator, consists of nests of brass tubes, through which the water circulates. The tubes are of brass, half an inch in diameter outside. The ends of the tubes are accessible through the man lids shown.—*The Engineer*.



IMPROVED AIR REFRIGERATING MACHINE.

The Utilization of Waste Ivory.

A curious and valuable contrivance has been explained to our Sheffield correspondent for the utilization of waste ivory—a subject of very great importance to other classes besides cutlery manufacturers, in consequence of the rapidly-increasing value of the article. The firm who have made the discovery—Messrs. Kilner Brothers, Albion Works, Holley street, Sheffield—have patented their plan, and applied it in the first instance to table cutlery. Their object is obtained by using odd ends of ivory, or ivory that is not sufficiently long for the ordinary length of handles, by cementing the pieces together, and by "tapping" the "tang." In this way each piece of ivory is screwed close to its fellow. The handle is then carved or fluted, by which means all joints are concealed. The tang passes through from end to end, and being riveted, the handle is prevented from leaving the blade, either by being placed in hot water, or by any other means which misdirected domestic ingenuity can contrive. Every housekeeper will appreciate this boon, as in the ordinary method of hafting table cutlery the handles come off with irritating frequency. By their patent, which is also applied to knives with bone, horn, and other handles, the firm can produce a really good article at about one-half the cost of ordinary knives. The ivory waste used in this way costs 2s. 6d. per pound—cut out of the solid piece it would be 20s. Among other specimens exhibited to our correspondent was a carving knife, the ivory handle of which, if the ivory was of one piece, would be worth 3s. 6d. The firm can supply the complete knife and fork for 4s. 3d., with the handle treated according to their patent.—*The Engineer*.

Omaha Waterworks.

The *Fireman's Journal* is informed that a suit has been begun by the Holly Manufacturing Company, of Lockport, N. Y., against the Omaha City Waterworks Company for infringement of Holly's patent of direct pressure. This suit, says the *Journal*, grows out of the fact that the Holly Company, after a long and bitter fight, was underbid by an Omaha company for the construction of the city waterworks. The Omaha company is building the works on the combined system of reservoir and direct pressure. It has distributed its pipe, partly built its reservoirs, and received part of the pumping machinery, and is under contract to complete the works by September next. This litigation may seriously complicate matters, and may postpone the completion of the works for some time, and possibly the plan of construction may have to be changed.

An Electric Storm.

A severe snow storm, accompanied by electrical disturbance and high wind, prevailed, January 6, over a space eight hundred miles wide, along the line of the Union Pacific Railroad between Omaha and Ogden. For twenty-four hours the telegraph wires were useless, the intensity of the electric storm being shown by the fact that when the telegraph key was opened by the operator a steady electric light burned at the connecting points. L. H. Korty, Chief Operator of the Union Pacific Telegraph lines, has kept a record for years, and with but one exception in twelve years, this storm occurred on the 5th, 6th, or 7th of January. It is believed that the entire Rocky Mountain region is visited by them.

To Fasten Cloth on Wooden Surfaces.

The following is said to be an excellent method of fastening cloth to the top of tables, desks, etc.: Make a mixture of 2¼ pounds of wheat flour, 2 tablespoonfuls of powdered rosin, and 2 tablespoonfuls of powdered alum; rub the mixture in a suitable vessel, with water, to a uniform, smooth paste; transfer this to a small kettle over a fire, and stir until the paste is perfectly homogeneous without lumps. As soon as the mass has become so stiff that the stirrer remains upright in it transfer it to another vessel and cover it up so that no skin may form on its surface. This paste is applied in a very thin layer to the surface of the table; the cloth, or leather, is then laid and pressed upon it, and smoothed with a roller. The ends are cut off after drying. If leather is to be fastened on, this must first be moistened with water. The paste is then applied, and the leather rubbed smooth with a cloth.

STRENGTH OF INSECTS.—At a meeting of the Maryland Academy of Sciences recently Dr. Theobald showed a species of a beetle and gave the following figures: Weight of beetle, two grains; weight moved by it, 5½ ounces—2,640 grains, or 1,320 times the weight of the beetle. A man weighing 150 pounds, endowed with the strength of this insect, should therefore be able to move 198,000 pounds, or nearly 100 tons.

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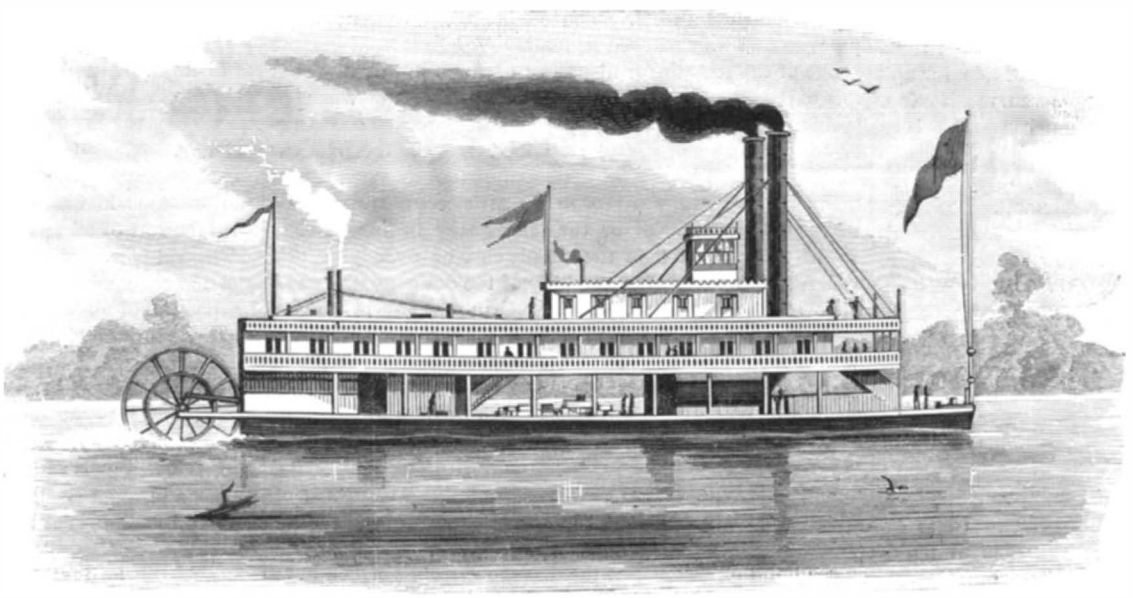
AMERICAN BUILT STEEL STEAMER FOR THE RIVER MAGDALENA.

BY H. L. BRIDWELL.

We recently published an illustrated description of a light draught steel steamer built in England for the Government of the United States of Colombia, to ply on the River Magdalena. American mechanics have also been engaged in constructing light draught vessels for the Magdalena, and we herewith present a view of the last one built in this country, the Victoria, belonging to the Magdalena River Navigation Company. The Victoria was built at Pittsburg, Pa., by James Rees, Esq., of the Duquesne Engine Works, who also built the Francis Montoya for the same stream, and, like the English steamer, was shipped in pieces after being temporarily set up.

The Victoria differs materially from the boat of the Yarrows, which has practically no upper structure, and is shorn of cabins and other accessories, in order to attain extreme lightness of draught. The Rees steamer was intended for a regular freight and passenger traffic, to accommodate which she is provided with a full length cabin on the upper deck and an officers' cabin above on the hurricane deck. The upper works are complete with all the appointments and fixtures of a regular North American river vessel. The hull is 155 feet in length, 32½ feet beam, and 4½ feet depth hold, constructed of steel, in eight watertight compartments. The boiler, also of steel, is of the locomotive type, 18 feet long, 45 inches in diameter, and has forty-one 3½ inch tubes, furnishing steam at a working pressure of 150 lb. per square inch. The cylinders are 16 inches diameter, with 6 feet stroke, of the direct-acting high pressure type. The steamer has a capacity of 400 tons cargo, and yet draws but 22 inches with steam up, a splendid result for a vessel so complete in all particulars.



STEEL PASSENGER STEAMER VICTORIA FOR RIVER MAGDALENA, S. A.

THE GECKO, OR WALL LIZARD.

Gecko is a name applied to a family of nocturnal lizards, numerous in species, found in all the warm regions of the globe. The name is said to be given them from the slight guttural cry which they make when pursuing their prey. In broad day they seem to be blinded by the rays of the sun, and repose half asleep, but when evening comes they regain all their agility.

Their appearance is quite repulsive; their bodies are flat, covered with a flabby skin, head large and flattened, a huge mouth armed with fine sharp teeth, their tongues short and fleshy, large eyes at the sides of the head, which are covered with transparent eyelids, the pupils narrow and vertical, like the cat and owl.

Considered as an impure animal by the Hebrews, the gecko is, in the extreme East, the object of great terror, and it is looked upon as impregnated with the most subtle poison. The ancient authors believed that the saliva of these animals was made use of to poison arrows. Bontius says that their bite is deadly, and another author relates that he saw at Cairo three ladies in great danger of death from having eaten some food upon which a gecko had stepped.

Although this animal is an object of repulsion and fear to the common people it appears to be absolutely inoffensive. M. Sauvage says, in *La Nature*, that he has often handled, without precaution, the different species of geckos, even the gecko of Egypt, so feared that it is named Abou-burz, or "father of leprosy," from the belief that it communicates that terrible disease to persons who partake of food with which it comes in contact.

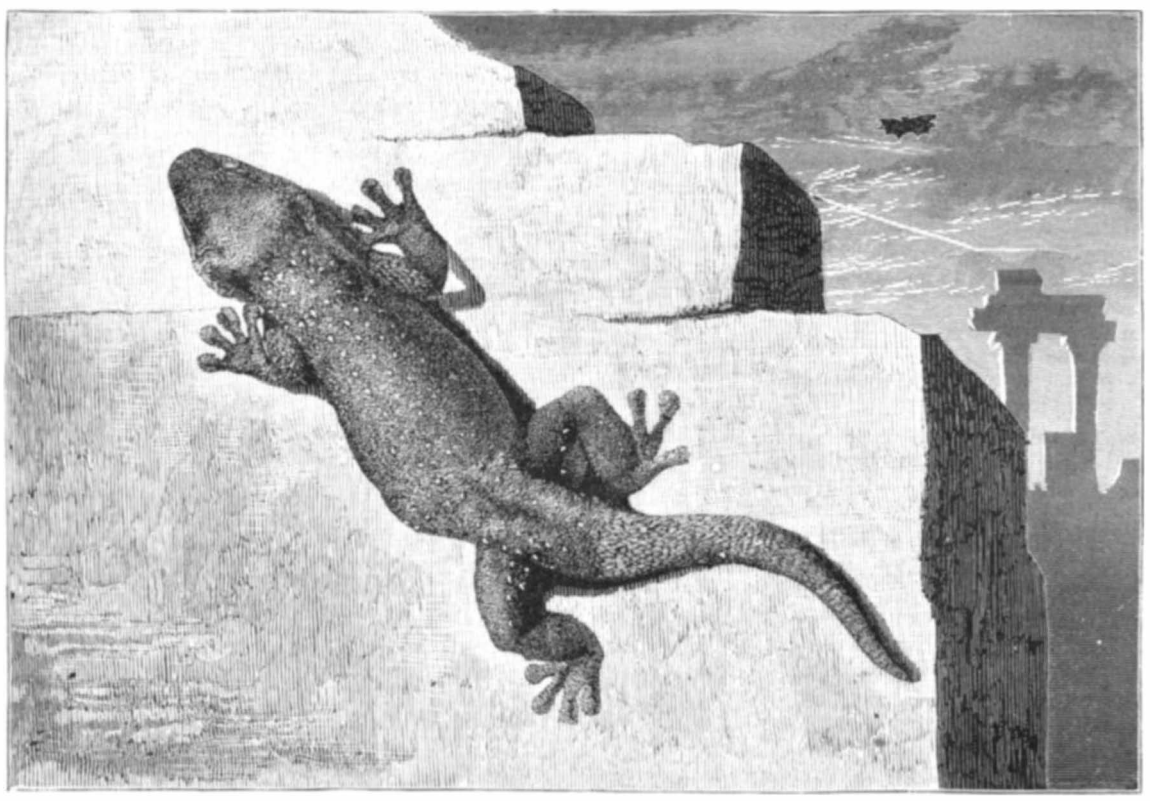
Geckos are useful to man, as they feed upon insects, caterpillars, and flies, which they entrap by placing themselves in ambush. They are often found in considerable numbers within doors, concealing themselves upon the roofs or crawling about upon the walls and ceilings. Their toes have, for the most part, a leaf-like expansion which enables them to walk even upon polished perpendicular surfaces, and they run noiselessly and with great rapidity in all directions. Their hooked claws, sometimes retractible like those of the cat, assist them to climb nimbly along the walls, where they hunt their prey from stone to stone, or by entering small crevices in the rocks into which their flat flexible bodies are able to penetrate.

Some geckos, as the platydactylus, have their toes widened the whole length, while the hemidactylus are expanded only at the base, and the phyllodactylus at the extremity of the toes.

These last, formerly supposed to inhabit only New Guinea, Australia, and Chili, have been found in Europe and are known as the European phyllodactylus. They were believed to be peculiar to Sardinia, but have lately been found by M. Lataste in the Island of Pendus in the Gulf of Marseilles.

The common platydactylus, which is found in Southern France, Italy, and Spain, was known to the ancients, who probably called it a lizard, and thought that its venom neutralized the poison of the scorpion. The bite of this animal, which was dangerous or even deadly in Greece, was, according to Pliny, almost inoffensive in Sicily. The same author says that the skin macerated in vinegar or reduced to ashes was a sovereign remedy in some diseases. In this species the body is often of a gray color, while the lower parts are whitish, but sometimes it is of a bronzed brown, with gray bands across the back and tail; the head, although flat, is thickened at the back, the neck being distinct from the body; the skin which envelops it is transversely folded. The upper part of the skull is covered with small convex plates, the oval tubercles are strongly defined and are surrounded by other smaller tubercles, and with fine granulated scales, protecting the back. The upper part of the tail is provided with spines.

The geographical distribution of the hemidactylus is the same as that of the species just described. The head is short, the nose very blunt, the surface of the skull slightly convex. The toes are all provided with claws, and are not united by a membrane. From the nape of the neck to the beginning of the tail the tubercles, like small nails, are arranged in longitudinal rows nearly approaching one another. The general color of the head is gray, sometimes reddish with brown marbling.



THE GECKO OR WALL LIZARD.

The Miocene Beds of Oregon and their Fossils.

A writer in the *Kansas City Review*, who has for some time been making collections of fossil remains for Professor Cope, says that although the miocene beds of the John Day River, Oregon, have been explored for nine or ten years, each year an equally rich harvest has been gathered. In none of his explorations in the fossil beds of the Northwest had he ever found such perfect specimens as those that he gathered in this region. One of his finds proved to be the type of a new genus, and was named by Professor Cope *Boocherus humerosus*, the specific name being given in allusion to a huge projection on the humerus. The skeleton was that of a mammal as large as a rhinoceros, and with great pillar-like limbs.

The most abundant fossil remains found have been those of the *Oreodon*, or extinct hog. Three or four species have been detected, some about the size of the Texan peccary, and others as large as the wild boar of Europe. These animals belong to tropical countries. The rhinoceros is quite common in these beds, three or more species being represented, one of them having a horn on each side of the end of the nose. The *Hipparion* and other ancestors of the horse are also found here. One peculiar genus discovered was an ancestor of the South American llama, and has been named by Prof. Cope *Probotherium Sternbergii*. Among the carnivora over ten species of dogs and tigers have been discovered. One large dog had terrible fangs, longer than those of a tiger, and which were sharply serrate-edged like the teeth of a shark. Another peculiar species had a shoulder on the lower canine, against which the point of the upper struck. This large number of carnivorous animals shows that herbivora were also abundant; and that such was the case has been proved, too, by the abundance of the remains of the latter that has been found. Of the rodents, a great number of species have been discovered, ranging from the size of a mouse to that of a beaver. Hard-shelled turtles were the only reptiles obtained; and these varied in size from six inches to two feet in diameter. One of the great difficulties in the way of working these beds lies in the dazzling color of the surface, which soon causes the eye to tire, and gives the explorer a sensation like that of snow-blindness. Hence, five hours' constant search has to be counted a good day's work. The miocene beds of Oregon extend over the greater part of the eastern part of the State. Thus far only the John Day and Crooked River have been explored. Rich harvests are in store for the future explorer. All the new genera and species found here are to be described and figured by Prof. Cope in one of the government publications.

The Composition of Serpents' Venom.

What a wonderful thing the venom of a serpent is! Chemical analysis fails to detect anything in it to account for its action. Water, a little albumen, some mineral salts, and traces of mucus, epithelial cells, etc., lumped together as "extractive." Nothing more—nothing specific about it, at all. Tasteless, colorless, and inodorous, it may be rubbed on the sound skin, or applied to the eye, or taken into the mouth without any result whatever. The bites of different kinds of snakes produce different effects; some act as a depressant to the vascular system, some as a powerful narcotic, some cause inflammation of the spine, while others seem to give rise to disorganization of the structural constituents of the blood. All are attended more or less with

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rigors, delirium, syncope, convulsions, paralysis, and coma. Whether the poisons of any two or more species are identical I do not know—it seems probable; but in the five species with which I have experimented on myself, so far I have found five distinct and separate venoms. I imagine, for instance, that the rattlesnake and copperhead will prove to possess the same, and perhaps several of the viperine snakes. I hope so. Some of these fluids are very unstable, and decompose if kept only a short time or if their specific gravity is disturbed, while others retain their deadly properties even when dried. That of the common French viper (*Vipera aspis*) may be diluted down till it forms a mere local irritant. No *true* antidote has ever been discovered for the bite of any snake, and the search for something which shall be an antidote against the bite of all, appears to me to be irrational in the extreme, seeing that there are so many different poisons, producing in many cases opposite effects. One might as well expect to find a general antidote for opium, belladonna, strychnine, arsenic, and mercury poisoning. The action of ammonia, upon which so much stress has been laid, is probably nothing more than that of a strong stimulant; certainly its action in maintaining the fluidity of the blood is quite hypothetical, seeing that premature coagulation of the fibrine has never been actually demonstrated. Indeed, it is said that at the autopsy of the keeper Girling, bitten many years ago by a cobra de capello at the Gardens, the blood formed no clot at all, but was found permanently fluid in all the great vessels.—*Land and Water.*

Sanitary Inventions in House Building.

The modern residence illustrates, in innumerable ways, the activity of inventors in recent years, and although so much has already been done the future seems to present a still wider field, with even more and more complex problems, whose successful solution will yield deserved award to inventive genius. To faults in our present system of building, principally in regard to the plumbing arrangements, the prevalence and generally dangerous character of diphtheria is now largely attributed. Whether or not it is true that the community is at present suffering from a greater prevalence of this disease than ever before, or whether the general conviction that this is so comes from the fact that the medical fraternity are now making a closer definition of its causes and nature, it is certain that defective methods of disposing of sewage cannot fail to contribute largely to its propagation. Leaving out of view entirely the question of sewage ventilation or disinfection, the advantages or disadvantages of different kinds of traps, the arrangement of house pipes, or the flooding of sewers, it is evident that, in closely populated sections, it needs only one break in the precautionary efforts to start a disease which may prove an epidemic. Of course the more perfect the system the smaller the number of such chances, and the easier it is to successfully combat the disease, but the common sewer forms a connecting link between the costly brown stone and the humble tenement. The latter, however, has the close supervision of the health authorities, which is too often omitted in the former case. It is not surprising to find, therefore, as recently stated by the President of the New York Board of Health, that some of the lately built tenement houses of the metropolis are actually safer residences, from a sanitary point of view, than many pretentious mansions. The latter had, perhaps, fairly good plumbing work at the start, but age and use have in many cases caused a gradual deterioration, possibly not noticed by continuous occupants, and improvements have since been introduced which make the contrast yet stronger, so that it is not uncommon now to find that the hidden and diffusive power of some infectious disease has its original source in abodes where such danger had been least looked for.

In a large proportion of the residences now erected in our principal cities, the question of cost is a minor consideration, so that the owner can obtain the maximum of comfort, convenience, and elegance, with the assurance that every possible condition necessary to making a healthful residence has been complied with. So we have the various methods of heating by steam, hot water, and hot air, either from appliances within the house, or, as now proposed, with the heat furnished from some central source of supply; it is, also, quite within the scope of the possibilities of the near future that we shall have a system of cooling houses and places of public entertainment in the summer season by artificially generated currents of cold air, quite as effectually as we can warm them at present. In the making of a light more economical and better than gas, inventors everywhere are now showing a marvelous degree of activity, and the employment of electricity for this purpose, and in the telephone and other ways, has, within a very recent period, opened up many new channels of improvement. In the mason, carpenter, joiner, and decorative work, money is expended unsparingly, and in many ways which were unknown a few years ago, to add either to the attractiveness or the durability of the residence. But, with all these efforts to attain an ideal perfection, there have been many conspicuous instances of failure to make a healthful dwelling place where it had been supposed that all the required conditions had been most rigidly complied with.

In city buildings, where the houses so adjoin each other that party walls are in common on both sides, it is not to be supposed that much attention need be paid to having a damp course to cut off soil emanations, a matter which is of great importance in all country houses; but with whole blocks of residences or tenement houses erected on made ground, where the filling-in material has been mixed with garbage, or where the natural drainage has been improperly provided for, an even worse condition will be likely to result than can come from building on a wet soil in the country without a suitable damp course. The exhalations from made ground of this character are certain to make themselves manifest sooner or later, and to permeate or be taken up, to greater or less degree, by the buildings erected thereon, and in such way that the sun and wind can have but little power to carry them off.

The one question, however, which stands out beyond all others in the matter of sanitary house building, is that of plumbing. The gas and water pipes are generally hid away, so that it is not easy to examine them, and the condition and adequacy of the sewer connections are almost always taken on trust. The effectual covering of water pipes so that they will not be liable to freeze in cold weather is one of the reasons for disposing of them in this way, but this only makes the work of repairing the greater when an accident does happen, and putting the pipes where they cannot be seen and readily examined, is often the frequent cause of a small leak making a great deal of damage. More than this, however, a defect in the sewer connecting pipes, whether from accident or the inadequacy of the service, means much more than the simple cost of remedying this evil, for upon the perfect working of the drainage pipes and their connections depends, more than on any other one cause, the healthfulness of a house or a neighborhood. With the pipes all in plain sight, or where they could easily be examined, there are few householders who would not make it their business to look into such matters, and be sure that there was no room in this way for the escape of foul sewer gases into their kitchens, and sleeping and living rooms. Many ingenious theories have been put forward of late in regard to proper systems of sewage for large cities, and "sanitary plumbing" has come to be an accepted term in the building trades, but the disastrous results which have in many cases followed the adoption of the most approved plans, point only too plainly to the fact that the specialists, as well as the public in general, have yet much to learn in this direction.

Oil of Coffee.

From a paper upon the oil of roasted coffee, contributed to a chemical journal by Dr. C. O. Cech, of St. Petersburg, we extract the following:

Although the coffee bean belongs to our daily food, we are still uncertain of the chemical nature and composition of the products of roasting coffee, and of oil of coffee, one of the important characteristic constituents of the bean.

The existence of a coffee oil makes itself known in a striking manner by its roasting, for this oil, driven out of the beans by the heat, is partially volatilized, and, together with other products of the roasting, produces the characteristic aroma of roasted coffee, an odor possessed by no other substance. In very strong black coffee, too, we can see this oil like little drops of grease floating on it. The amount of oil in coffee varies from 8 to 13 per cent, and at least half of this is lost in roasting, so that it would be a paying experiment to attempt to collect this oil, especially in large establishments where much coffee is burned and several pounds of oil are dissipated daily. In 1878 not less than five hundred thousand tons of coffee were consumed, so that the amount of oil that might have been collected was very considerable. Dr. Cech tried the experiment, in one of the large roasting establishments of Berlin, of connecting the roasting drum with a cooling apparatus and a receiver so as to condense and collect the volatile and oily products of the roasting. At first there is scarcely any gas generated in the drums, but after the beans are browned and the whole mass has been heated to the temperature where the oil evaporates, such a quantity of the volatile aromatic oil is generated that it trickles down the walls of the chamber in which the beans are shoveled and cooled after coming from the drums. Unfortunately the manipulations of roasting are at present such, that this very cooling and reshoveling of hot beans must be done in the open air, and is the reason that it is not possible to catch and condense the vapors so abundantly liberated. Practice has proven that at the very moment when the beans turn brown and the first vapors begin to be given off it is absolutely necessary to pull the drum out of the roasting furnace and rapidly cool the coffee by shoveling and reshoveling in the air, or there is danger of its taking fire in the furnace and burning to a coal. Nevertheless it might be feasible to connect the drums with an exhauster so as to condense the gases in a receiver, and at the same time cool the bean enough to prevent its taking fire. Cech has no doubt that the oil obtained in this manner would find use, at a profit, in making liqueurs.

To study the properties of oil of coffee, Dr. Cech pounded up 50 lb. of different kinds of coffee in a mortar, and then extracted it with alcohol and ether, obtaining about 1,200 grammes (2½ lb.) of oil of coffee. The beans extracted by him were not of equal value as regards the yield of oil, for while some contained as high as 13 per cent, other kinds fell below 8 per cent.

The oil of coffee is a green, thick, transparent oil, and after some time a few long needles were deposited from it. These proved to be caffeine. Since caffeine is not extracted from the exhausted beans by ether, and very little of it is taken up by the alcohol employed, the coffee from which the oil has been extracted could be employed for the manufacture of caffeine.

The coffee oil became turbid in half a year, although it was kept in hermetically closed bottles. Small groups of crystals were formed in the middle of the liquid, and slowly settled to the bottom, and at the end of three years the bottle was two-thirds full of a dirty mass of crystals consisting of the solid fatty acids, but the upper layer of the liquid remained for years transparent, clear, and of a beautiful green color, proving that a portion of coffee oil consists of liquid oleic acid.

Although Dr. Cech has had the oil in his possession for three years he has not determined its percentage composition.—*J. pr. Ch.*

An Easy Test for Olive Oil.

One of the rarest articles of daily use is *pure* olive oil, and many think themselves fortunate to obtain oil which is in part made from the olives. Add to this fact the difficulty of distinguishing one vegetable oil from another by chemical test, especially of recognizing them when mixed, and no wonder the importers of olive oil soon accumulate a competency.

A German soap journal tells its readers how to detect adulterations in oils, without, however, enlightening them as to the sort of oil used for adulteration.

The test is exceedingly simple, and can be performed by any one possessing a good chemical thermometer. About a teaspoonful of oil is put in a test tube, and a thermometer suspended in the oil, which is now to be heated to 250° C. (472° Fahr.). For a comparison a second test tube of pure oil may be treated in like manner. Pure olive oil, when heated, grows rather lighter in color, but most other oils, like cotton seed, peanut oil, etc., grow darker. The latter, also, evolve a penetrating and disagreeable odor, but olive oil has a pleasant smell not unlike strawberries. This test, devised by Merz, is at least worthy of a trial.

Salicylic Acid for Bee Stings.

Although salicylic acid, from having been too highly extolled, has fallen somewhat into disfavor, there can be no doubt that it is useful in the case of bee stings. An Austrian paper recommends the following treatment: First, to remove the sting as quickly as possible with a forceps or by scratching with a finger, but never between the thumb and forefinger, because this squeezes more of the poison into the wound. Next squeeze the wound until a drop of blood comes out, and rub the place as large as a dollar with an aqueous or dilute alcoholic solution of salicylic acid. The effect is still better by injecting the salicylic acid into the wound with the hypodermic syringe. After this the spot is painted with collodion to keep out the air. A sting treated thus causes little or no pain, slight inflammation and swelling, and is not followed by nettle-fever or lameness in the most sensitive and nervous individuals. P. N.

Testing Drain Pipes.

A writer in the *Ironmonger*, from long practical experience in testing drain pipes, confidently recommends for that purpose what he terms a "smoke test," and which gives evidence as to leaks both to the sight and smell. The materials that he employs are soiled cotton waste and sulphur, the smoke from which, after ignition, is blown into the drain or pipes. If leakages exist in the latter inside of the house, the smoke and smell both issue forth and show that something is wrong, and generally tell also just where the fault or faults are. Sulphur, as well known, is one of the best of disinfectants, and a dose of the fumes from this to the drains, after disease has been in a house, would effect much good.

Ripening Melons Underground.

As well known, there are many plants which thrust their seed vessels into the ground, where the seeds are subsequently matured. The peanut is a good example of a plant which constantly exhibits this phenomenon. Others again develop flowers and seeds entirely underground, while many aquatic plants ripen their seeds under water. According to the *Gardener's Chronicle* the Persians, who are extensive cultivators of melons, have the curious practice of covering this fruit with earth at a certain stage. Such a method is in vogue among Persians who live in the neighborhood of Tiflis, in the Caucasus. Only the choicest and best keeping variety, the true Dutma, is grown. It is a long, smooth kind, which attains a weight of fifteen to twenty pounds, and will keep till Christmas. The deeply tilled ground is thrown up into beds a foot wide in spring, and the seeds sown in a drill along the center. Finally, the plants are left at a great distance apart, and irrigation is effected through the channels between the beds, so that no water touches the plants. The fruit sets in June, and only one or two are left on each shoot. When the fruit has attained the size of a man's fist the earth is hollowed out, and the shoot (with the exception of the tip), together with its fruit, is buried therein to a depth of one to one and a half inches, where it remains until the fruit is almost ripe. Considerable practical experience is necessary in order to be able to determine the exact moment when the melons should be unearthed. When the cultivator thinks that the time has arrived, he withdraws the shoot and its fruit from the ground. This is done toward evening, and the fruit is left on the surface of the ground, attached to the shoot, and exposed to the dew of one night; but care is taken to cut the fruit the next morning before the sun can reach it. It is then hung in a cool, dark, dry place, until ready for eating.

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Detection of the Trichina.

Another death from *trichiniasis*, under exceptionally severe circumstances, having recently occurred, public attention is again being directed to the ravages of that terrible parasite, the *Trichina spiralis*.

A young German butcher, Franz A. Axler, apparently suffering from a severe attack of rheumatism, was lately admitted into Bellevue Hospital. For several days the physicians who visited the ward to which Axler was assigned were unable to make a diagnosis of his case; but eventually, and as a result of close watching, the conviction grew that he was suffering not from rheumatism, but from trichiniasis. This disease not yet having been relegated to that class about which it may be said "we know all about it," it is not to be wondered at that the greatest interest in this case was immediately manifested by many distinguished medical men. Upon due inquiry having been made, the fact was elicited that Axler had a short time previous to the first indications of disease been freely partaking of raw pork, a practice to which he, in common with some others of his countrymen, appears to have been somewhat addicted. To make "assurance doubly sure," Professor Janeway one day with his lance removed from the patient a small piece of muscular tissue, which, having been placed under the microscope, revealed the presence of numerous living active trichinæ. Axler eventually died; although, as we shall show, the disease, while formidable, is not necessarily *fatal* in all cases. A *post mortem* examination with the microscope, of course, showed that the active parasite had increased and multiplied to such an extent that every muscle in his body (which was teeming with parasitic life) had been attacked and destroyed by this apparently insignificant creature of nature.

In the case now recorded, and for obvious reasons, death ends all; but indications are not wanting that much trouble may yet arise and much legal skill and acumen be imported into the settlement of other cases of trichiniasis, and that the pork butcher or even middleman may be liable to be proceeded against at law by the relatives of those who have succumbed to disease contracted through eating diseased meat. When Mrs. Eliza Greifelt sued Figge Bros., in Brooklyn, for $5,000 as *solatium* for the death of her husband, who died from trichiniasis claimed to have been produced through eating of a ham supplied by this firm, a significant fact in the rendering of the verdict (which was against the plaintiff) lay in the allegation that it had not been proved that the disease had been contracted from eating that ham in particular, but, on the contrary, that death had ensued before the time when disease from such a source could have run its course; while, more directly, the evidence was such as would lead to the belief that the disease from which Mr. Greifelt died had been contracted by indulging, at a previous date, in certain pork sausages imported from Cincinnati. The verdict leaves for the butchers or dealers the slight unpleasantness that it might have been otherwise rendered had it been clearly shown that the trichiniasis from which the man died had been caused by the Brooklyn ham instead of by the Cincinnati sausage. The inference from this is too palpable to escape due notice or to require special attention being directed to it. But another portion of the charge of the judge in this case is still more significant, and to the public at large more important. In trade, he observed, persons were only bound to use "ordinary care and skill," and not the most scientific processes. This opens up the question as to what constitutes the "ordinary care and skill" standard on the part of dealers, and whether it be not possible to raise this standard a good deal higher than it appears now to be without entailing upon the butchers or sellers the necessity of incurring undue pecuniary expenditure or the acquiring of any special degree of scientific skill.

Previous to indicating simple means to both the butchers and the housewife by which diseased pork can be discovered, and showing the latter by what means the parasitic life forming the disease can be stamped out with certainty, a glance at the life history of that parasite is necessary.

In nearly every case of trichiniasis the disease has been contracted, as already observed, by the eating of raw or underdone pork. But it must also be observed that the pig is not the only animal eaten by man the flesh of which forms an abiding place for trichinæ. It has been said that the flesh of fowls is sometimes not exempt from them; that they are to be met with in rabbits we know, having seen several well developed examples in the flesh of that animal. Having partaken of a meal of raw, or even "rare," or underdone meat containing trichinæ, the recipient has in his stomach probably many thousands of the animal, if not in the full grown, at any rate in the condition of larvæ, which are not affected by contact with the gastric juice. In forty-eight hours they will have passed from the larval into the adult condition, arrived at which they immediately commence their destructive march through every tissue of the body. The life-cycle of these creatures appears to be completed in about three weeks, although there is much yet to be learnt of their history. Two days suffice for their passing from the capsuled to the adult condition; the eggs from the adult take about six days to be developed into embryos. Death does not necessarily ensue when one's flesh is trichinized, for in many instances the disease comes to a termination by the animals perishing by the process of calcareous degeneration.

Both the butcher and dealer, as well as the lay portion of the public are interested in the best and easiest methods by which the presence of trichinæ in pork may become known. Every scientific man, of course, knows that the microscope is the revealer of this parasite; but it is not so generally known that a simple hand magnifier shows their presence with a degree of certainty and perfection that puts beyond the realm of doubt the fact of any sample of flesh being trichinized or not.

To examine pork, cut off in the longitudinal direction of the fiber and by means of a sharp razor a *thin* slice of the flesh about half the size of the nail of the little finger, and having placed it *in situ* on an ordinary microscopic slide or any other suitable piece of glass put on it a drop of liquor potassæ, cover it with another thin slip of glass, and keep the two firmly pressed together by means of spring clips—the ordinary spring clothes pegs being very convenient for this purpose. Upon examination by the microscope the thin and almost transparent layer of muscle will show the worms coiled up in their cysts, or moving about freely, according to the stage at which their development has arrived. This, of course, is on the assumption that the specimen undergoing examination is infected.

The microscopic power best suited for such examination is a low one, ranging from one to three inches; an objective of two inches being the most convenient, provided its defining quality is such as to enable it to be used with a tolerably high-power eye piece, which in the early stage of examination—the search—is not advisable, the lowest eyepiece being best.

We have said that the presence of trichinæ may be readily seen by a hand magnifier. By this must be understood one possessing a short focus and so constructed as to define very sharply. Those we have found most satisfactory are formed on the principle first enunciated by Dr. Wollaston, and named after him "the Wollaston doublet." It consists of two plano-convex lenses, their respective foci being as one to three, their convex surfaces being next to the eye, and the stronger of the two placed next to the object that is to be examined. By placing a diaphragm between the two the definition is improved. But even by a simple bi-convex lens, such as are used in the lowest type of microscopes as object glasses, may the trichinæ be seen, provided the focus be short and the peripheral rays cut off by means of a small diaphragm. Let it not be forgotten that by a "magnifier" of this simple form were made all those brilliant discoveries by Leeuwenhoek which astonished the scientific world at that time (A.D. 1678), and introduced a new system of philosophy and reasoning. If the lens used in the examination of trichinæ be one of plano-convex form it is important that its flat side be toward the object, for if this condition be reversed there will arise such a degree of spherical aberration as will render futile the hope of seeing distinctly. The amount of the aberration under the latter condition may be assumed as 4·5 times the thickness; whereas if reversed the aberration is only 1·17 of its thickness. The best form of simple or hand microscope is the Wollaston doublet, and the degree of magnifying most suitable for the purpose in question is one which need not exceed the ability to show the markings on the scales of the well known *Lepisma saccharina*.

From the facility with which the presence of the parasite in pork may be discovered, and the trivial nature of the expenditure to be incurred in securing the proper optical means for doing so, it is not unreasonable for the public to demand that the standard of the "ordinary care and skill" referred to by the Brooklyn judge be raised, and that such standard shall embrace the possession of a microscope, either simple or compound, and the ability to make use of it to such an extent at any rate as will enable the butcher or dealer to examine any suspected sample of meat.

One consolation remains. Man has been defined as "an animal that cooks his food;" and so long as he acts in accordance with this distinctive characteristic, so long will he be free from all harm arising out of the presence of parasitic life in his pork. Experiments prove that *partial* cooking does not destroy trichinæ, and it is probably owing to this fact that there are so many thousands in Germany who are trichinized, for in that country undercooked pork is freely partaken of. At a heat of 160° Fah., sufficiently prolonged to enable it to penetrate the capsules in which they may be inclosed, the germs of life are totally destroyed. But when the heat is raised to the boiling point, 212° Fah., then may it be assumed a matter involving no doubt whatever that the power of the trichinæ for good or evil has been suspended by death.

The Diffusibility of Carbolic Acid.

One day last December the people of Newark, New Jersey, were greatly annoyed by a taste of carbolic acid in the city water, supplied from the Passaic River. The matter was investigated, and the contamination was traced to a paper mill ten or twelve miles up the river, where an incredibly small amount of carbolic acid had been allowed to get into the water. If the report of Mr. Geo. Shepard Page is correct, the occurrence will furnish a new illustration of the wonderful divisibility of matter, and the extreme delicacy of the sense of taste. Mr. Page says, in a letter to the *Tribune:*

"The paper mill of the Messrs. Kingsland is located on the Third River, a stream of considerable magnitude, two miles from where it empties into the Passaic. From the latter point to the pumping station of the Newark Water Works is also two miles. The volume of water in the Third River is not less than 2,000,000 gallons per day, and in the Passaic 150,000,000 gallons per day. The Messrs. Kingsland, among other specialties, carbolize paper by immersion in a bath of the best liquid carbolic acid of a quality such as is used in medicinal preparations. In the process of manufacture there is a small percentage of waste paper. No paper has been carbolized since last June, when not over a hundred pounds of waste or torn paper were placed in the loft of the mill, where it remained until the last of December. It is well known to chemists and many intelligent persons that carbolic acid (really an alcohol and not an acid) evaporates rapidly when exposed to the air. To the sense of smell there was no evidence of carbolic acid in this waste paper when the Messrs. Kingsland decided, in December, to work it up again. Dust having accumulated on it, washing in the mill pond was necessary.

"A few days after this a perceptible taste of carbolic acid was noticed by the people of Newark, not only in the drinking water, but also in tea and coffee made with boiling water. As an absolute fact, not over ten pounds (a gallon) of carbolic acid had been used in this paper when treated. Certainly 30 per cent had evaporated, leaving not over seven pounds to permeate 200,000,000 gallons of water, a portion of which was aerated by passing over rapids and dams, through four miles of river, seven miles of pipe, and countless taps. It would seem incredible had we not the evidence of chemists and medical men in Newark perfectly familiar with the peculiar taste of carbolic acid. Pardon me the space occupied by this narrative, but so remarkable a scientific fact deserves to be recorded. Of course no injurious effects would be experienced, as a single carbolic troche would contain more acid than a thousand gallons of Passaic water. Indeed, a beneficial effect should be felt (of course, to a limited extent), in neutralizing Paterson and Passaic sewage, below which cities Newark and Jersey City obtain most of their water supply"

Lead Pipes Destroyed by Mortar and Cement.

In German cities, where the streets are not decorated by festoons of telegraph wires strung upon towering masts like a dismantled forest, but securely buried in leaden pipes, the telegraphic cables are out of sight and protected from ice and fire, some interesting experience has been gained. On taking up these cables it has been found that in some places the lead pipe had become brittle and porous, and a chemical examination showed that the lead had been converted into a basic carbonate (white lead). It was found that this change had taken place only where the pipe had come in contact with mortar or cement.

Dr. Rossel, who has experimented with lead, finds that in contact with lime mortar it always loses perceptibly in weight, and in contact with cement the loss is nearly as great. Lead buried in moist earth that contains chlorides, saltpeter, and sal ammoniac, lost weight, but to a much less degree than in mortar. The sulphates, like plaster of Paris and Glauber salts, had no action upon lead; neither did the carbonates, like chalk, soda, and potash, nor the silicates, sand, and clay. He calculates that a pipe one millimeter thick, or one twenty-fifth of an inch, might be eaten through in fifteen or sixteen months.

[We have ourselves seen lead pipe destroyed by holes and indentations on the outside as if bored by an insect, but were unable to ascertain the nature of the soil where it had lain.—ED.]

From his own observations Dr. Rossel makes the following statement:

1. Lead pipes should never be brought in contact with any sort of mortar or cement.

2. Clay does not attack lead pipe if free from sal ammoniac and saltpeter, the latter resulting from the decay of organic matter.

3. Plaster of Paris offers the best protection for lead pipes. Wherever lead pipes pass through a wall they should be laid in gypsum, over which mortar or cement can then be safely laid. P. N.

Separating Apparatus for Cesspools, etc.

BY J. LESUEUR, PARIS.

To separate the liquid from the solid matters they are caused to pass from the pan to a perforated cylinder closed at bottom by a pivoted perforated plate. The liquid matters escape through the holes in the cylinder and bottom to a suitable pipe. The solid matters are retained on the bottom plate until they are sufficiently heavy to overcome a counterweight attached thereto, when the bottom plate turns on its axis and deposits the matters into a pipe leading to the cesspool.

Phosphor Tin.

An alloy of tin with phosphorus has been in use in Germany for some time for making phosphorus bronze. A practical man gives it as the result of his experience that such a compound must contain at least 9 per cent of phosphorus, else part of the tin will remain uncombined. If more than 9 per cent of phosphorus is introduced the excess will be oxidized and volatilized, because the tin is unable to take up and hold more than a certain quantity of phosphorus. A compound containing 9½ per cent of phosphorus corresponds to the formula P_2Sn_5, corresponding to the higher oxide P_2O_5.

To Fix Pencil Marks.

To fix pencil marks so they will not rub out, take well skimmed milk and dilute with an equal bulk of water. Wash the pencil marks (whether writing or drawing) with this liquid, using a soft flat camel hair brush, and avoiding all rubbing Place upon a flat board to dry.

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Business and Personal.

The Charge for Insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

The H. W. Johns Mfg. Co.'s new colors of Asbestos Liquid Paints are particularly appropriate for large structures, such as manufactories churches, bridges, etc. We advise all owners of such buildings which require painting to send for samples.

Van Beil's "Rye and Rock" is acknowledged to be the best remedy for lung and throat diseases.

Hartshorn's Self-Acting Shade Rollers, 486 Broadway, New York. No cords or balances. Do not get out of order. A great convenience. Sold everywhere by the trade. See that you get Hartshorn's rollers. Makers and dealers in infringing rollers held strictly responsible.

Hotchkiss' Mechanical Boiler Cleaner, 84 John St., N. Y., illustrated SCI. AM., Nov. 6, 1880. New, enlarged, and simplified form; quite inexpensive. Engineers make ten per cent selling other parties than employers.

Street Sweeper, Smith's patent, for sale. Machinery Exchange, 261 N. 3d street, Philadelphia.

Second-hand large size Wood Planer, R. Ball & Co. make, for sale cheap, by Wm. M. Hawes, Fall River, Mass.

Don't buy a Steam Pump until you have written Valley Machine Co., Easthampton, Mass.

Standard—Reliable—Popular.—The Steel Pens manufactured by the Esterbrook Steel Pen Co., 26 John street, New York. Works, Camden, N. J.

Wm. Sellers & Co., Steam Hammers. See ad., p. 108.

The Practical Papermaker; a complete guide to the manufacture of Paper, by James Dunbar. $1.00. Mail free. E. & F. N. Spon, 446 Broome street, New York.

Best Turkey Emery and Star Glue, specially for polishers. Greene, Tweed & Co., 118 Chambers st., N. Y.

Millstone Dressing Diamonds. Simple, effective, and durable. J. Dickinson, 64 Nassau street, New York.

Mechanical Draughtsman desires engagement. Thorough mechanician. Bright on special machinery and tools. A. C. C., Box 773.

Wanted—An experienced and thoroughly capable machinist, competent to design, build, and set up in working order light, special machines in a manufacturing business; also to superintend repairs in shop connected with the factory; must furnish best reference as to character, habits, and ability. Address P. O. Box 539, Baltimore, Md.

Rubber Packing, Soapstone Packing, Hemp Packing, Empire Gum Core Packing. Greene, Tweed & Co., N. Y.

Will sell reasonably, Patent Mill Feeder. Suitable for millwrights to handle. Jas. P. Lowell, patentee, Purcellville, Va.

Builders of tramways and machines for crosscutting timber in forests, send circulars to Wm. Brown 2212 De Kalb street, St. Louis, Mo.

Abbe Bolt Forging Machines and Palmer Power Hammer a specialty. S. C. Forsaith & Co., Manchester, N. H.

L. Martin & Co., manufacturers of Lampblack and Pulp Mortar-black, 226 Walnut St., Philadelphia, Pa.

Foot Power Machinery for use in Workshops; sent on trial if desired. W. F. & Jno. Barnes, Rockford, Ill.

Large Slotter, 72" x 18" stroke. Photo on application. Machinery Exchange, 261 N. 3d St., Phila.

List 25.—Descriptive of over 2,000 new and second-hand machines, now ready for distribution. Send stamp for same. S. C. Forsaith & Co., Manchester, N. H.

Burgess' Portable Mechan. Blowpipe. See adv., p. 76.

Books for Engineers and Mechanics. Catalogues free. E. & F. N. Spon, 446 Broome St., New York.

Send to John D. Leveridge, 3 Cortlandt St., New York, for illustrated catalogue, mailed free, of all kinds of Scroll Saws and Supplies, Electric Lighters, Tyson's Steam Engines, Telephones, Novelties, etc.

Pure Oak Lea Belting. C. W. Arny & Son, Manufacturers Philadelphia. Correspondence solicited.

Within the last ten years greater improvements have been made in mowing machines than any other agricultural implement. It is universally acknowledged that the Eureka Mower Co., of Towanda, Pa., are making the best mower now in use, and every farmer should write to the manufacturers for catalogue, with prices.

Jenkins' Patent Valves and Packing "The Standard." Jenkins Bros., Proprietors, 11 Dey St., New York.

Presses & Dies. Ferracute Mach. Co., Bridgeton, N. J.

Wood Working Machinery of Improved Design and Workmanship. Cordesman, Egan & Co., Cincinnati, O.

The "1880" Lace Cutter by mail for 50 cts.; discount to the trade. Sterling Elliott, 262 Dover St., Boston, Mass.

The Tools, Fixtures, and Patterns of the Taunton Foundry and Machine Company for sale, by the George Place Machinery Agency, 121 Chambers St., New York.

Experts in Patent Causes and Mechanical Counsel. Park Benjamin & Bro., 50 Astor House, New York.

Corrugated Wrought Iron for Tires on Traction Engines, etc. Sole mfrs., H. Lloyd, Son & Co., Pittsb'g, Pa.

Malleable and Gray Iron Castings, all descriptions, by Erie Malleable Iron Company, limited, Erie, Pa.

Power, Foot, and Hand Presses for Metal Workers. Lowest prices. Peerless Punch & Shear Co. 52 Dey St., N. Y.

Recipes and Information on all Industrial Processes. Park Benjamin's Expert Office, 50 Astor House, N. Y.

For the best Stave, Barrel, Keg, and Hogshead Machinery, address H. A. Crossley, Cleveland, Ohio.

National Steel Tube Cleaner for boiler tubes. Adjustable, durable. Chalmers-Spence Co., 40 John St., N. Y.

Best Oak Tanned Leather Belting. Wm. F. Forepaugh, Jr., & Bros., 531 Jefferson St., Philadelphia, Pa.

Stave, Barrel, Keg, and Hogshead Machinery a specialty, by E. & B. Holmes, Buffalo, N. Y.

Wright's Patent Steam Engine, with automatic cut off. The best engine made. For prices, address William Wright, Manufacturer, Newburgh, N. Y.

Split Pulleys at low prices, and of same strength and appearance as Whole Pulleys. Yocom & Son's Shafting Works, Drinker St., Philadelphia, Pa.

Clark Rubber Wheels adv. See page 109.

Presses, Dies and Tools for working Sheet Metal, etc. Fruit & other can tools. Bliss & Williams, B'klyn, N. Y.

Blake "Lion and Eagle" Imp'd Crusher. See p. 109.

The Brown Automatic Cut-off Engine; unexcelled for workmanship, economy, and durability. Write for information. C. H. Brown & Co., Fitchburg, Mass.

National Institute of Steam and Mechanical Engineering, Bridgeport, Conn. Blast Furnace Construction and Management. The metallurgy of iron and steel. Practical Instruction in Steam Engineering, and a good situation when competent. Send for pamphlet.

Nickel Plating.—Sole manufacturers cast nickel anodes, pure nickel salts, importers Vienna lime, crocus, etc. Condit, Hanson & Van Winkle, Newark, N. J., and 92 and 94 Liberty St., New York.

The I. B. Davis Patent Feed Pump. See adv., p 76.

Moulding Machines for Foundry Use. 33 per cent saved in labor. See adv. of Reynolds & Co., page 76.

C. B. Rogers & Co., Norwich, Conn., Wood Working Machinery of every kind. See adv., page 77.

Saw Mill Machinery. Stearns Mfg. Co. See p. 77.

The Sweetland Chuck. See illus. adv., p. 76.

Machine Knives for Wood-working Machinery, Book Binders, and Paper Mills. Also manufacturers of Soloman's Parallel Vise, Taylor. Stiles & Co., Riegelsville, N. J.

Rollstone Mac. Co.'s Wood Working Mach'y ad. p. 92.

Fire Brick, Tile, and Clay Retorts, all shapes. Borgner & O'Brien, M'f'rs, 23d St., above Race, Phila., Pa.

Eclipse Portable Engine. See illustrated adv., p. 93.

4 to 40 H P. Steam Engines. See adv. p. 93.

For Machinists' Tools, see Whitcomb's adv., page 73.

Apply to J. H. Blaisdell for all kinds of Wood and Iron Working Machinery. 107 Liberty St., New York. Send for illustrated catalogue.

Peck's Patent Drop Press. See adv., page 109.

The Chester Steel Castings Co., office 407 Library St, Philadelphia, Pa., can prove by 15,000 Crank Shafts, and 10,000 Gear Wheels, now in use, the superiority of their Castings over all others. Circular and price list free.

Brass & Copper in sheets, wire & blanks. See ad. p. 109.

Wren's Patent Grate Bar. See adv. page 109.

The Improved Hydraulic Jacks, Punches, and Tube Expanders. R. Dudgeon, 24 Columbia St., New York.

For best Indirect Radiators, see adv., page 109.

Eagle Anvils, 10 cents per pound. Fully warranted.

Engines repaired without loss of time. L. B. Flanders Machine Works, Philadelphia, Pa.

Machinists' Tools and Special Mach'y. See adv., p. 109.

Houston's Four-Sided Moulder. See adv., page 109.

H. A. Lee's Moulding Machines, Worcester, Mass.

For Shafts, Pulleys, or Hangers, call and see stock kept at 79 Liberty St., N. Y. Wm. Sellers & Co.

For Mill Mach'y & Mill Furnishing, see illus. adv. p. 108.

The Student's Illustrated Guide to Practical Draughting. By T. P. Pemberton. Sent on receipt of price, $1. Address T. P. Pemberton, 5 Dey St., Room 13, New York.

New Economizer Portable Engine. See illus. adv. p. 108.

Wm. Sellers & Co., Phila., have introduced a new injector, worked by a single motion of a lever.

Skinner & Wood, Erie, Pa., Portable and Stationary Engines, are full of orders, and withdraw their illustrated advertisement. Send for their new circulars.

Saunders' Pipe Cutting Threading Mach. See p. 109.

Toope's Pat. Felt and Asbestos Non-conducting Removable Covering for Hot or Cold Surfaces; Toope's Pat. Grate Bar. Chas. Toope, M'f'g Agt., 353 E. 78th St., N. Y.

Use Vacuum Oil Co.'s Cylinder Oil, Rochester, N. Y.

Notes & Queries

HINTS TO CORRESPONDENTS.

No attention will be paid to communications unless accompanied with the full name and address of the writer.

Names and addresses of correspondents will not be given to inquirers.

We renew our request that correspondents, in referring to former answers or articles, will be kind enough to name the date of the paper and the page, or the number of the question.

Correspondents whose inquiries do not appear after a reasonable time should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them.

Persons desiring special information which is purely of a personal character, and not of general interest, should remit from $1 to $5, according to the subject, as we cannot be expected to spend time and labor to obtain such information without remuneration.

Any numbers of the SCIENTIFIC AMERICAN SUPPLEMENT referred to in these columns may be had at this office. Price 10 cents each.

(1) B. R. asks: What is the best method of spreading a thin layer of selenium on glass surfaces and other smooth surfaces of that description? A. This is a subject of which there is but little known at present, for, as *Nature* says, "the investigation is one that requires to be carried on with the aid of a fully equipped laboratory, and is beyond the power of an ordinary experimentalist." It is, in the meantime, uncertain as to whether a transparent sheet of selenium can be more easily obtained by a method of precipitation than by mere mechanical treatment. It dissolves fuel in chloride of selenium and precipitates slowly in a botryoidal mass of black selenium. It also separates in the crystalline form from solutions of selenide of potassium or sodium. In its vitreous condition selenium melts at a temperature of about 220° Fah., and can be drawn out between mica plates to a thin red film.

(2) C. V. S. asks: 1. How many mercury flasks, as described in SUPPLEMENT, No. 182, would I need for a boiler for a boat 30 feet long, 6 or 6½ feet beam, and 3 feet deep? A At least 60 for water and 30 for steam. 2. In laying the keel, should it be of one piece of oak, 33 or 34 feet long, steamed and bent to form the bow; or should it be a piece of oak, 33 or 34 feet long, with the bow and stern post rabbeted to the keel? A. It may be steamed and bent, or the stem and stern posts may be scarped to the keel and fastened by rivets. 3. What size should the engine be for a boat 30 feet long, of the style described in SUPPLEMENT, No. 81, of the Flirt, built by H. S. Maxim? A. 5 inch to 6 inch cylinder and 6 inch stroke. 4. Could I with a boat of this size go from New York city to United States of Colombia, say to Aspinwall, and if so, what would I need besides compass, charts, and lamps? Would I have to get any papers permitting me to go on said voyage, as the owners of vessels have to have? A. It must be inspected and licensed if over 5 tons measurement.

(3) D. A. asks: 1. Which is the better device to keep steam on a self-propelling fire engine: to keep a banked fire in the furnace, or to use a heater similar to those employed with the ordinary fire engine? In fact, is the first method a safe one? A. We consider the heater the safest. 2. In connection with a heater for keeping water hot in an engine, which pipe should be the largest: the one leading to or from the engine? A. It is quite as well to have both pipes of the same size; but if a difference is made, the return pipe should be the larger.

(4) F. W. F. asks: 1. How can I polish a small plano convex lens which is slightly scratched on the surface? A. See article on lens making, vol. xliii. page 51, SCIENTIFIC AMERICAN. 2. What preparation shall I apply to paper or other substance to take pictures with a camera, and cost of same? A. This information to be of any practical value would require too much of our space. Consult some good work on photography. 3. Why is a meniscus lens better for the object glass of a refracting telescope than a double convex lens, so stated in SCIENTIFIC AMERICAN SUPPLEMENT, No. 252? Does it give less prismatic colors? A. With the meniscus there is less spherical and chromatic aberration. 4. I have a private acoustic telephone line; line wire very small size copper wire. At each end I have a wire also of copper two or three times as large as line wire, running down into moist earth and twisted around the line wire. Will these wires convey to the ground any charge which the line may receive during a thunder shower, preventing all danger to the inmates of the houses? A. Yes, providing the ground ends are terminated in a coil buried in a bushel or so of coke which is always enveloped in moist earth. It would be better to solder your ground wire to a gas or water pipe if possible.

(5) E. W. C. asks: 1. Can a rotary engine such as the "La France Fire Engine," be run backward by bringing the steam in through the exhaust pipe? A. Yes. 2. Could such engine be run by gas, by having the explosion at regular intervals? A. It might be run in that way. 3. Which would be the most economical, the above or a cylinder engine using gas, the power being 2,000 foot pounds? A. The cylinder engine.

(6) J. B. H. asks: What will restore on silks and silk laces luster lost in dyeing? A. Grate half a dozen large potatoes into a gallon of soft water, agitate briskly for a few minutes, and let stand 24 hours to settle. Carefully draw off the clear liquid, and with this sponge the fabric thoroughly. Press very strongly with hot irons—in one direction—between fine cloths; kept moist.

(7) E. B. asks: What are the dimensions and tonnage of the yacht America, whether she is keel or center board, and the lengths of her spars? A. Yacht America's original dimensions were: Length on load, water line, 90 feet 8 inches; breadth, extreme, 22 feet 6 inches; carpenter's tonnage, 210 tons. Her present masts are: mainmast, 78 feet long; foremast, 76 feet 6 inches; mainboom, 70 feet long; foreboom, 26 feet long.

(8) F. L. P. writes: In your issue of January 22, in reply to L. D. G., you say the pressure on the feed pipe is a trifle more than on the boiler. Will you be so kind as to explain how you get the extra pressure? A. The difference in pressure is due, first, to the greater area, the upper, than the underside of the delivery valves; second, to the friction of the valves; and third, the friction of the water in the pipes and passages.

(9) U. D. M. asks: 1. What is the rule for running a belt from one pulley on to another on a bevel so as to run the shafts on an angle? A. You will find the rule with a diagram on page 27 (5), Vol. 40, SCIENTIFIC AMERICAN. 2. How much power can we use on the end of a 1½ inch shaft 250 feet long, without twisting it? A. It depends upon the speed of the shaft. 3. How large a steel wire rope do we need to 5 horse power, 250 feet from first pulley? A. It depends upon the speed of the rope. You can get tables of sizes and speeds from manufacturers of wire rope. 4. Which is the cheapest and best to use for 5 horse power, 250 feet from driving pulley, steel wire rope or iron shaft? A. Wire rope.

(10) J. S. H. writes: I have an office hand lithograph press for printing letters on stone. I get a splendid impression of transfer on the stone, but after dampening the stone with a sponge it seems to take the ink almost as readily as the transfer, thus smutting up the print. I use a buckskin roller and printer's news ink. Can you tell me how to proceed so that the stone will not take the printer's ink except where the transfer ink strikes, and how to get a clear and clean print? A. Let the stone dry and wash it with a 2 per cent aqueous solution of nitric acid; rinse in water and then in weak gum water preparatory to inking. Add a little stale beer or vinegar to the water used for dampening. Use good lithographic ink.

(11) B. I. B. asks: What kind of varnish or oil will be best for preserving eggs, and how can it be applied so as to have a thin, even coating? I want something in which eggs can be dipped. A. You may try ordinary linseed oil (used for this purpose in Germany), or thin alcoholic shellac varnish. See SUPPLEMENTS, Nos. 53 and 65; also SCIENTIFIC AMERICAN, Vol. 39, p. 375.

(12) J. S. H. writes: I see many inquiries in your columns asking how to clean the aniline ink from printing pads after through printing. I can answer. Saturate a sponge in water as hot as possible to bear the hand in, pass the wet sponge across the face of the pad and the ink will disappear. Then rinse off the face with the sponge dipped in cold water. Experience has also taught me that when the print begins to get dim, if you will dampen the face of the pad with a sponge dipped in cold water, the ink becomes as bright as at first, and in this way a much larger number of letters may be pulled than if this process is not employed.

(13) C. C. C. asks: Is there no way in which rubber could be softened in process of making rubber stamps except by heat? A. Sulphide of carbon, benzole, turpentine, and the essential oils in general cause rubber to swell and soften. While thus softened it may be moulded; but as the oils or other liquids used escape by evaporation it shrinks again. Softening by heat gives more satisfactory results.

(14) T. B. asks: Which has the most friction, a locomotive crank pin seven inches in diameter or one four inches in diameter, the width of bearing being the same in both cases? A. The conditions being the same, the friction would be the same in both cases, but the loss of power would be greater with the larger pin, as the friction acts upon a longer radius.

(15) J. W. asks: 1. What sized belt will give 180 horse power under following conditions: Driving pulley 7 feet in diameter, driven 4 feet, belt in contact with one half the circumference of 4 feet pulley, speed of belt 3,300 feet per minute? Please give rule. A. Calculate by the following formula, $\frac{WS}{600}$ = horse power, W = width of belt in inches; S = speed of belt in feet per minute. In your case belt should be 33 inches wide in round numbers. In this case 600 is used for a divisor, because of the favorable conditions; for narrow belts use 800.

(16) E. H. asks (1) how much power a certain size pulley (say 12 inches diameter. 6 inches face) will transmit at a given speed to a pulley of equal size. A. We suppose your pulley of 6 inches face would run a 5 inch belt. A safe rule for the power of a belt is $\frac{W\ S}{800}$ = horse power, where W = width of belt in inches, and S = speed of belt in feet per minute. From this you can get the power of your pulley. 2. Can you recommend a book treating on the subject? A. "Cooper on the Use of Belting."

(17) L. J. C. asks for the best methods of sticking paper together to make paper boats, pails, or things similar. A. One of the following cements will probably answer: 1. Waterproof: gum rubber, 1 lb.; shellac, 2 lb.; benzole, 12 lb. Cut the gum rubber into fine shreds, and macerate it with frequent agitation in the benzole until dissolved. Then place the vessel (out of doors) in a bath of hot sand, and gradually add, with constant stirring, the powdered shellac. Heat and stir until a perfectly homogeneous mass is obtained—marine glue. In heating, the best vessel to use is a porcelain enameled iron dish. For a stirring rod use a pestle. 2. Gum rubber, 1 lb.; asphaltum (not tar), 2 lb.; benzole, q. s. Cut the rubber fine, macerate until it is dissolved in the benzole, then gradually add the asphaltum, triturate together in a mortar until all is softened and dissolved. It should have about the consistence of molasses. 3. Resin, 2; boiled oil, q. s.; plaster of Paris, 2; turpentine oil, ¼. Melt the resin in the heated oil, remove out of doors, and stir in the plaster and turpentine while hot.

(18) W. R. R. writes: We are building a water tank 15 feet diameter, 10 feet deep, to hold water pumped from a well; the water will be used to supply and wash out our locomotives. Should the inside of tank be painted? If so, what is best? A. Paint with brown oxide paint (oxide of iron), ground in and mixed with pure linseed oil.

(19) J. S. M. asks: Are the rims of railway car wheels chilled? If so, will the rim and center of the wheel, when remelted, be equally soft in temper? A. They are chilled, and when remelted, the effect of the chill is, to a great degree, destroyed.

(20) J. T. M. asks for a receipt for staining whisky barrels a weather-beaten color. A. Use a strong aqueous solution of green copperas (sulphate of iron) or nitric acid.

(21) C. W. V. writes: 1. I want to tin hoop iron. What can I use to take off the scale? I have tried muriatic acid, but it does not seem to clean it. A. Pickle in a bath of muriatic acid 1 part, water 20 parts, until the red oxide disappears, rinse and heat to redness to remove the scale, hammer on an anvil, and immerse in a bath of fermented bran water at 100° Fah. for about 12 hours. On removing brighten by pickling in oil of vitriol 1 part, water 20 parts, at 100° Fah. Finish by scouring with hemp and fine sand. This is the usual method. 2. Can I mix lead with the tin? If so, what proportion can be used? A. Lead can be mixed with tin up to 50 per cent, but in such a bath the lower portions soon become richer in lead on standing, and the results are not good.

(22) J. S. B. M. asks: 1. How can mica be dissolved so as to form a varnish? A. Mica cannot be dissolved so as to be useful in the way you propose. 2. What is the best article I can use to bring zinc (metal) to a high polish for engraved signs? A. Use fine pumice stone and a little oil first, and finish with fine tripoli.

(23) E. H. B. asks: What is the method used to keep an ice house dry—the air dry—so that eggs or products similar can be kept in it for some months without spoiling? A. The dryness of an ice house depends more on its construction than anything else. The ice receptacle should be located so that the moisture of the room may be condensed on it and conveyed away.

(24) G. T. asks for a receipt for a first class office mucilage. Something that will not blister the paper as most of them do. A. Try the following: Good gelatin, 5 oz.; rock candy, 20 oz.; gum arabic, 3 oz.; water, 20 oz.; oil of cloves, a few drops. Soak the gelatin in the cold water over night, then heat to boiling for several hours (replacing the lost water), and gradually introduce the other materials.

(25) M. L. B. asks for a good receipt for a preparation that will effectually stop a constant steam leak when red lead is insufficient, such as around stud bolts, or cracks in castings, etc. I once was handed for trial a preparation resembling yellow clay to be ap-

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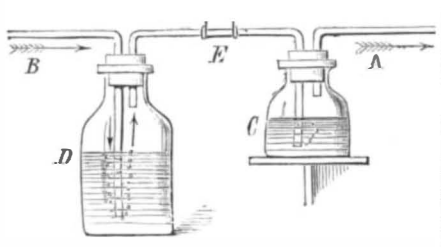
plied just before turning on steam, that became very hard; but lost name of article. A. Iron cements or rust joints are generally used for such purposes. The following receipts are good: 1. Iron borings, pounded fine in a mortar, 1 lb.; sal ammoniac, in powder, 2 oz.; flowers of sulphur, 1 oz. Mix the whole thoroughly dry. For use mix 1 part of the above with 20 of fine iron borings, and mix with water to the consistence of mortar. Use at once. 2. Iron borings, 2 lb. (clean); flowers of sulphur, 1 oz.; sal-ammoniac, 1 oz. 3. 98 parts fine, clean iron borings, and 1 part each flowers of sulphur and sal-ammoniac, all dry. Mix thoroughly and moisten with hot water, when required for use. 4. Fine clean iron borings, 1 lb.; sal-ammoniac and spirit of salt, each half an ounce; water to moisten thoroughly when required for use. The joint should be allowed to rest for at least 10 hours before putting under pressure. For cracks calk in a little rope yarn fiber first, then calk in the cement.

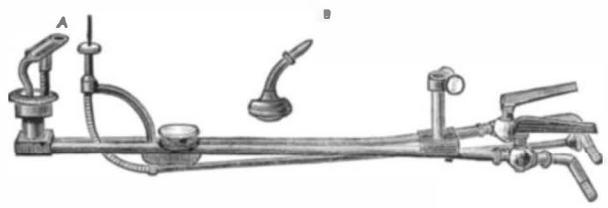
(26) C. M. asks for an easy chemical test for injurious gas in rooms warmed by a coal furnace. A. We know of no simple way of testing air for such impurities. Carbonic oxide, the most to be dreaded of such products of combustion is very difficult to detect, in such a connection by chemical means, but as it usually accompanies or is accompanied by carbonic acid gas, in such cases the detection of any considerable quantity of the latter serves as an indication of the presence of the former. Carbonic acid is detected in air by drawing the air through a solution of lime in distilled water (clear filtered). Carbonic acid precipitates carbonate of lime from such a solution, making the liquid more or less milky. It should be remembered that all air contains a trace of carbonic acid, hence the liquid will always be more or less affected. Experiment first with pure out-of-door air, then with the air of a badly ventilated room, passing about the same volume of air, and you will soon be able to judge whether very much



carbonic acid is present or not. A simple apparatus for such tests is made from two glass bottles with good stoppers and a few pieces of glass tubing, as indicated above. D contains the lime water. C, a safety bottle to prevent the entrance of air from the lungs entering through E. The mouth is applied at A. The air enters at B.

(27) R. A. & J. S. ask: Have you ever known machinery of 170 horse power driven by a rubber belt? What should be the width of a belt to convey that amount of power? A. Yes, if the speed of your belt is 3,000 feet per minute it should be about 30 inches wide. We refer you to two cases mentioned in "Cooper on Belting," page 157.

(28) A. M. B. and others inquire how to make an oxyhydrogen jet for a magic lantern. A. The cut shows a very convenient form of oxyhydrogen jet. It is provided with two interchangeable jets, A B; the spindle, which holds the lime cylinder, is adjustable lengthwise of the gas tubes, and is rotated by a flexible shaft connected with a revolving spindle extending to



the back of the lantern. The burner is supported by a rod (not shown) projecting from a movable base. The jet, A, is of the annular form, the small central jet being for oxygen and the annular jet surrounding it for the hydrogen. There is no internal communication between the two pipes. The jet, B, combines both gases in the chamber beneath, and is not safe unless both gases are under equal pressure. Common illuminating gas may be used in place of pure hydrogen in the jet, A, and it may be taken directly from the burner of an ordinary gas fixture. Where two lanterns are employed the dissolving effect is secured by turning off the oxygen.

(29) S. M. W. asks for the process of gilding on common stone china, such cheap ware and gilding as we see so frequently at present in the shops. Also can such ware be gilt by a gold solution without the use of fire? A. The gilding is done either by an adhesive varnish or by heat. The varnish is prepared by dissolving in hot boiled linseed oil an equal weight of either amber or copal. This is diluted with a proper quantity of oil of turpentine so as to be applied as thin as possible to the parts to be gilt. Let stand after varnishing about 24 hours, then heat in an oven until so warm as almost to burn the fingers when handled. The heat softens the varnish, which is then ready to receive the gold leaf, which may be applied with a brush or pledget of cotton, and the superfluous portions brushed off. Burnish when cold, interposing a piece of thin paper between the gold and burnisher. Where burning in is practiced the gold reduced to powder is mixed with powdered borax glass (anhydrous borax), moistened with a little gum water, and applied to the clean surface with a camel hair pencil. When quite dry the article is put into a stove heated to about the temperature of an annealing oven. The gum burns off, and the borax, by vitrifying, cements the gold with great firmness to the surface.

(30) M. M. H.—To temper gun springs, heat them evenly to a low red heat in a charcoal fire, and quench them in water with the cold chill off, keeping them immersed until reduced to the temperature of the water. Place an iron pan containing lard oil and tallow, in about equal quantities, over a fire, and place the springs therein, and heat the pan until its contents take fire; then hold the springs in the flames, turning them over and over and dipping them occasionally in the oil to keep them blazing; when the oil adhering to them blazes freely when they are removed from the flames, place them aside to cool off.

(31) B. A. and others ask how to produce an illuminating composition. A. Cleanse oyster shells by well washing, expose them to a red heat for half an hour, separate the cleanest parts, and put into a crucible in alternate layers with sulphur; now expose the vessel to a red heat for an hour at least. When cold break the mass, and separate the whitest parts for use. If inclosed in a bottle it is said the figures of a watch may be distinguished by its aid. To renew the luminosity of the mass place the bottle each day in the sun, or in strong daylight; or burn a strip of magnesium wire close to the bottle. The sulphide of lime will thus absorb light, which will again be available at night.

(32) A. R. asks how to utilize old bones for fertilizing purposes. A. Unless the quantity is very large, the bones should be crushed fine as possible with a heavy iron hammer, mall, or with a large stone mortar. Place the fragments in a heating compost of yard manure and ashes, taking care to moisten it frequently with liquid manure if to be had, or with water in default of the urine. By spreading a thin coat of fresh earth or plaster over the pile, the escape of the valuable ammonia will be prevented. Six months' time will suffice to disintegrate the bones and produce as complete and effective a manure as can be made on the farm. The proportion of ashes to bones should be at least an equal amount of ashes as of bones; more will do no harm. The larger the amount of manure, within reasonable bounds, the better; at least two or three times as much as of both the others is advisable.

(33) H. P. R. asks how to make a small battery for operating electric jewelry. A. The essential parts of such a battery are, two plates of carbon, one plate of well amalgamated zinc, and a solution made by dissolving 2 parts of bichromate of potash in 20 parts of hot water, and when cold adding 1 part of sulphuric acid. The zinc plate is placed between the two carbon plates, leaving a space on each side. The carbon plates are connected together and with one of the conducting wires, the zinc plate is connected with the other conducting wire. The zinc and carbon plates may be attached to a rubber stopper fitted to a small jar or bottle containing the bichromate solution at the bottom below the ends of the plates, and the solution may be brought into contact with the plates by turning the bottle down on its side. This battery works powerfully for a short time, but the solution soon becomes exhausted and must be replaced.

(34) M. B. B. asks: What is the best and easiest way of making a magneto or crank battery—one that can be made at home? A. There is no really easy way, but perhaps the easiest way is to mount an electro-magnet wound with No. 36 wire on a shaft so that it may revolve in proximity to the poles of a permanent U magnet. The sides of the magnet should be parallel to the plane of rotation of the electro-magnet and as near to the latter as possible without actual contact. The terminals of the magnet wire should be soldered to a commutator consisting of a split ferrule attached to an insulating cylinder on the magnet shaft. The ferrule should be divided at diametrically opposite points, and one end of the wire should be attached to each half of the ferrule. The commutator cylinder thus formed and connected is pressed by two springs insulated from each other and connected with metallic handles to be grasped by the person treated by the current. The commutator cylinder is turned upon its shaft until the maximum current is realized, when it is fastened. The machine may be driven by a small round belt, and its power may be augmented by using a compound permanent magnet.

MINERALS, ETC.—Specimens have been received from the following correspondents, and examined, with the results stated:

M. M.—The boiler incrustation consists of iron, lime and alumina sulphate, carbonate and silicate, derived from impure feed water. It may injure the metal if allowed to accumulate.—C. S. T.—No. 1. Garnets—the stones are hardly clear or perfect enough to be of much value to jewelers. No. 2. Diallage—a lime magnesia silicate. No. 3. Limonite—an iron ore. No. 4. Marcasite—white iron pyrite. No 5. Serpentine and calcite. No. 6. Calcite—crystallized lime carbonate.—F. F.—No. 1. Quartz rock. No. 2. Granite.—G. D. H.—It contains lead acetate, beside much organic matter. Would require a chemical analysis.

COMMUNICATIONS RECEIVED.

On a Method of Applying Tin Foil to Leyden Jars. By T. S.

On Multicolor Printing. By E. G. B.

English Patents Issued to Americans.

From January 14 to January 18, 1881, inclusive.

Boats and vessels, masting and rigging for, J. McLeod, New York city.
Cake machinery, J. H. Mitchell, Philadelphia, Pa.
Caoutchouc, treating, G. M. Mowbray, North Adams, Mass.
Carpet-cleaning machine, W. McArthur, Philadelphia, Pa.
Dumping boats, N. Barney, Bergen Point, N. J.
Fog signal, F. Brown, New York city.
Grain drier, G. B. Boomer, New York city.
Metallurgical furnace, J. G. McAuley, Denver, Col.
Piston rod packing, C. C. Jerome, Chicago, Ill.
Screws, countersinking wood, J. Eckford, San Antonio, Texas.
Tool holders, J. M. Bibbins, Williamsport, Pa.
Valves for steam engines, J. N. Rowe, Rockland, Me.
Waterproof fabric (2 cases), D. M. Lamb, New York city.

[OFFICIAL.]

INDEX OF INVENTIONS

FOR WHICH

Letters Patent of the United States were Granted in the Week Ending

January 18, 1881,

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

A printed copy of the specification and drawing of any patent in the annexed list, also of any patent issued since 1866, will be furnished from this office for one dollar. In ordering please state the number and date of the patent desired and remit to Munn & Co., 37 Park Row, New York city. We also furnish copies of patents granted prior to 1866; but at increased cost, as the specifications not being printed, must be copied by hand.

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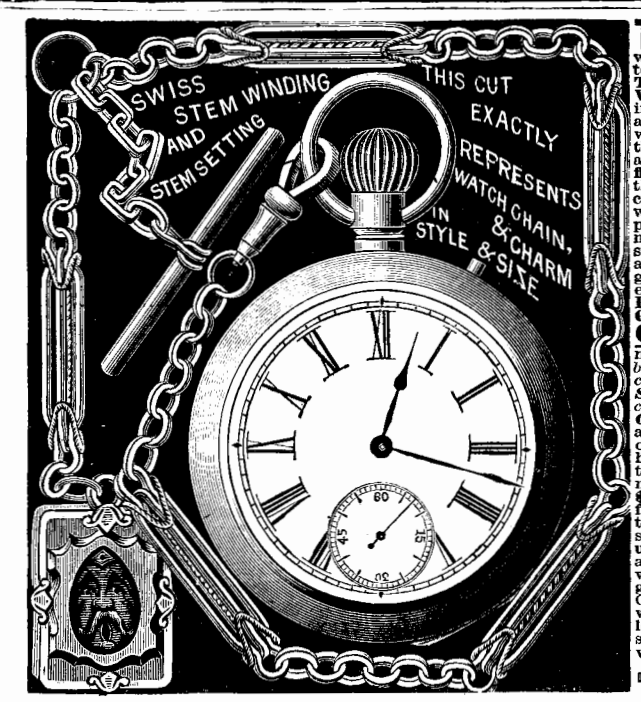

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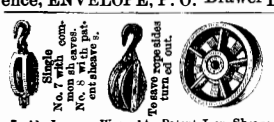

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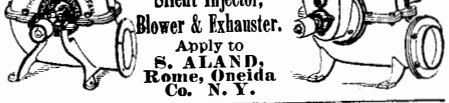

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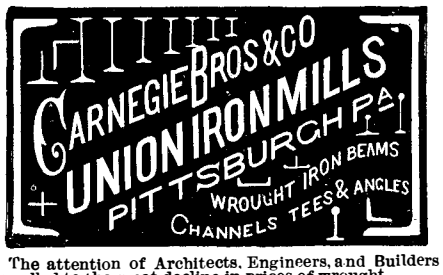

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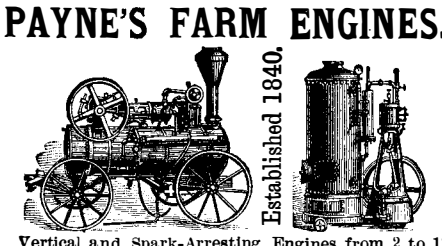

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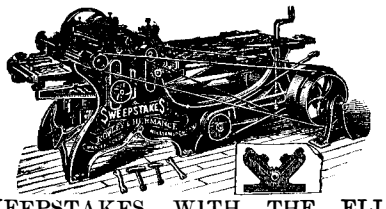

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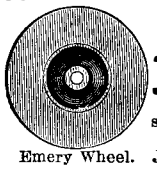

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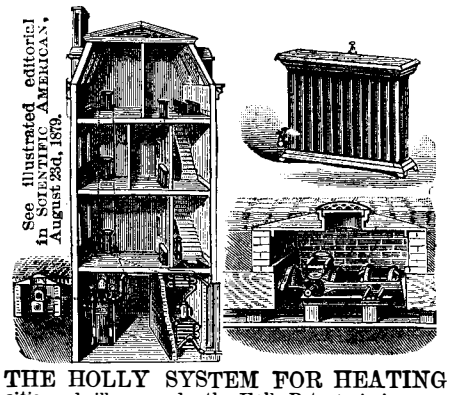

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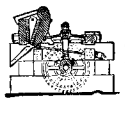

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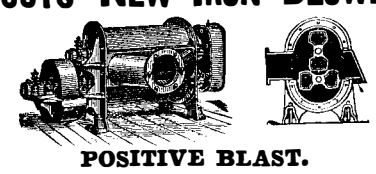

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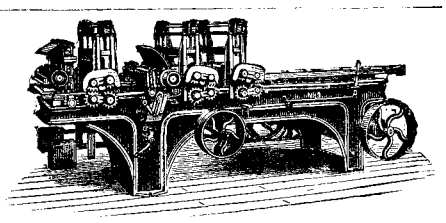

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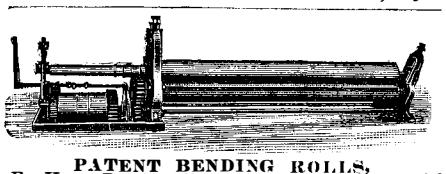

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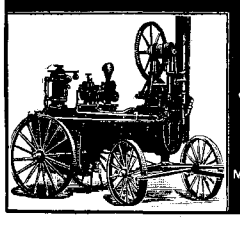

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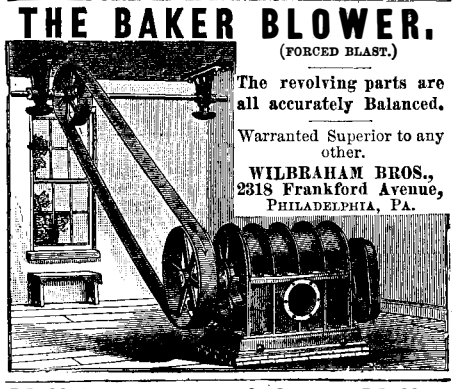

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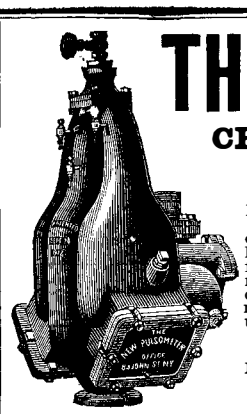

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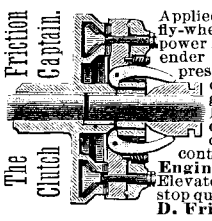

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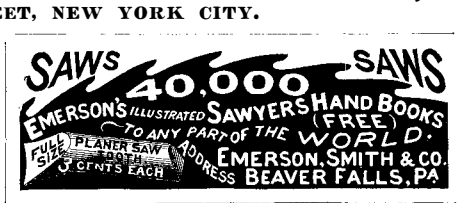
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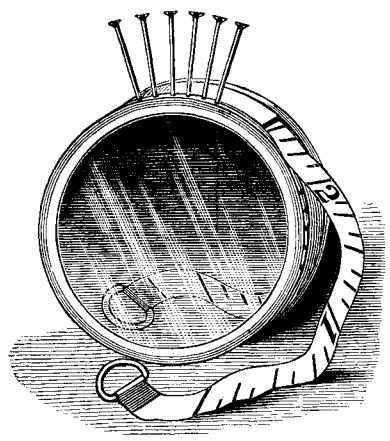

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